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ABSTRACT

This publication presents the standards required of a person practicing diamond drilling in western Canada and provides an outline for teaching the skills and knowledge. It is divided into two parts. The Diamond Drilling Specification Manual establishes the levels of skill and knowledge required in the four certified levels of diamond drilling. The manual not only establishes the standards required but also enables employers to relate pay and responsibility to a uniform standard. A method is included for assessing and assigning certification for drillers who have not been trained through this program. The Diamond Drilling Course Outline represents the requirements for teaching diamond drilling for levels one through four. Informative material found at the beginning of the level 1 course outline provides a general description and aim, class limit and instructor requirements, facilities requirements, equipment requirements, performance check list, and suggested weekly timetable. Summaries of the course outline for each level are provided. The course outline for each level specifies the objectives, location(s) of instruction, task, teaching points, teaching method(s), time required, material and equipment required, teacher suggestions, checks, and references. (YLB)

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ED246289

DIAMOND DRILLING SPECIFICATION MANUAL AND COURSE OUTLINE

Prepared by
Western Diamond Drilling
Contractors Association
for the
Ministry of Education

BC
Province of British Columbia
Ministry of Education
POST-SECONDARY DEPARTMENT
1984

CE 039351

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INTRODUCTION

The Diamond Drilling Course Outline was developed through the cooperation of the Western Diamond Drilling Contractors' Association (WDDCA) and the Post-Secondary Department of the Ministry of Education. The project was initiated by the Education and Training Committee of WDDCA. Committee members actively working on the project were:

Joe Benard
John Booth
Wolf Kuehne
Noble Larsen
Al McDougal

THE DEVELOPMENT PROCESS

Dacum

This program outline was developed using the Dacum process, a systematic model for developing modular training programs. A series of four booklets describing the Dacum process is available from:

Publication Services Branch,
Ministry of Education,
878 Viewfield Road,
Esquimalt, B.C.
V9A 4V1
Telephone: (604) 387-5331

Dacum Workshop and Skill Profile Chart

A three-day Dacum workshop identifying the work performed by diamond drillers was conducted by Diane Morrison, program developer with the Ministry of Education. The following representatives participated in the workshop:

John Baxter
Gordon Belec
John Booth
Wayne Boprey
W. Castle
John Corsi
Brian Fraser
Ken Gibson
J. Gorry
Kevin Griffiths
W. Hayworth
Bill Hutulla
Al McDougal
Byron Richards
Peter Rogal
L. Shaw
Ray Shultz
Roger Sylvestre

Gerry Varteniuk from the Diamond Drilling Program at the Northern College of Applied Arts and Technology, South Porcupine, Ontario was a special guest at the workshop and gave invaluable assistance in developing the skill profile.

The Dacum workshop participants produced the Diamond Drilling Skill Profile Chart, which listed the essential skills needed by a diamond driller on the job. During the following months, the skill profile chart was circulated to representatives throughout the diamond drilling industry for validation.

Program Outline

Once a skill profile chart is approved, the next step is to write a program outline. For each skill on the chart, one or more objectives is written stating what the learner must be able to perform at the end of the training program to demonstrate mastering the skill. A program outline developed using this approach is often referred to as a performance-based or competency-based outline.

T.H.M. (Jerry) Silva was asked to write the diamond drilling program outline from the skill profile chart. Several of the participants who attended the diamond drilling workshop worked with Jerry in writing special sections of the program outline. Gordon Belec worked closely with Jerry throughout the writing of the outline. When the draft of the outline was completed, the steering committee met to review it. Jerry incorporated the recommendations made by the committee into the outline.

Field Testing

A diamond drilling training course based on the outline was field tested at Pacific Vocational Institute with Gordon Belec as the instructor. Final revisions were then made to the outline.

USE OF PROGRAM OUTLINE

The diamond drilling instructor should use this outline as a guide when preparing lesson plans both for classroom and practical learning activities. The outline should also be used as a guideline for written, oral, and practical testing. Instructors should ensure that upon completion of training each learner can perform every objective listed in the outline.

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GENERAL DESCRIPTION AND AIM OF THIS PUBLICATION

General Information

The aim of this publication is to present the standards required of a person practicing diamond drilling in western Canada. It specifies the knowledge and skill required, provides an outline for teaching the skills and knowledge, provides reference data to be used for instruction and provides information on implementing training and certification of diamond drillers. This publication includes two parts:

1. Diamond Drilling Specification Manual
2. Diamond Drilling Course Outline

The third part, the Reference Manual, is available directly from the Western Diamond Drilling Contractors Association, 351 Alberta Street, New Westminster, British Columbia, V3L 3J4.

Diamond Drilling Specification Manual

The specification manual establishes the levels of skill and knowledge required in the four certified levels of diamond drilling. These levels are:

Level 1:	A newcomer to the field who has been trained to be a helper.
Level 2:	A driller able to work with minimal supervision.
Level 3:	An experienced driller able to work without supervision.
Level 4:	An experienced driller who is ready to work at the foreman level.

The manual is of value not only to establish the standards required but also to enable employers to relate pay and responsibility to a uniform standard. Included in the specification manual is also a method for assessing and assigning certification for drillers who have not been trained through this program.

Diamond Drilling Course Outline

The course outline represents the requirements for teaching diamond drilling. Instructors following this outline can be confident that their trainees will achieve the skill and knowledge level set out in the specifications. The course outline specifies the teaching points, the level required, the time required, the material and equipment required and offers suggestions on conducting the course.

The Reference Manual

The Reference Manual is to be used in conjunction with the course outline as it contains notes and data that amplify the information set out in the course outline. It can be used not only as a reference manual for the instructor but also as a source of material that can be reproduced to form the start of a reference library for the trainee.

DEFINITIONS

General Information

In the specifications, reference is made to the skill and knowledge standard that is required. These standards are defined as:

Skill Levels	Knowledge Levels
1. Skilled ability	1. Detailed knowledge
2. Semi-skilled ability	2. Basic knowledge
3. Limited ability	

In order to avoid tedious repetition, the skill and knowledge standards are defined below. When using the specification manual or the course outline, reference to the definitions will aid in clearly understanding the skill or knowledge standard that is required.

Skill Levels

Skilled Ability – To have a skilled ability the trainees must be completely familiar with the task or subject and demonstrate an ability to perform the procedures without supervision. They must have the confidence and competence to work independently and safely.

Semi-skilled Ability – To have a semi-skilled ability the trainees must be capable of performing a task under supervision. To do this they must complete the task under instruction or have the task suitably demonstrated or explained, so that with supervision and guidance they can perform the task on the job.

Limited Ability – To have a limited ability the trainees must have sufficient experience to perform the task on the job under direct supervision. The task must be thoroughly demonstrated and explained, and trainees should be able to safely and efficiently practice and develop further skill on the job.

Knowledge Levels

Detailed Knowledge – At this level the trainees must have enough familiarity with the subject to pass a written or oral examination. The knowledge retained must enable them to perform on the job without supervision.

Basic Knowledge – At this level the trainees must understand the terms and objectives of the subject and be able to work on the job under adequate supervision. A basic knowledge must also provide trainees with sufficient information to understand and benefit from job experience.

USE OF THE DIAMOND DRILLING SPECIFICATION MANUAL

Use of the Manual by Diamond Drillers

The manual can be used by drillers for personal assessment within the four level system. They should be able to relate their own knowledge and skill levels to the requirements presented in the specifications. This will provide them with an awareness of where they stand in their careers and an ability to assess what training or experience would be most beneficial to their progress. For those who have not been trained within the four level system the specification manual provides a means of assessment and certification.

Use of the Manual by Employers

By using the manual employers will be better able to estimate the potential value and efficiency of an unknown diamond driller. In the past such estimates were based primarily upon personal knowledge of the applicant because there was no uniform standard of training or evaluation. The certification system combined with a job resume provides a more comprehensive estimate of a potential employee. This skill and knowledge estimate is of great value to employers because it provides information to aid them in:

1. Hiring and assessing an unknown driller.
2. Assigning personnel to jobs that are within their capability.
3. Career planning for employees.
4. Relating pay scales to skill and knowledge.

GENERAL INFORMATION AND USE OF THE DIAMOND DRILLING COURSE OUTLINE

General Information

The course outline gives suggestions for conducting training for diamond drillers and details the subject content of lessons. The course outline is derived directly from the diamond driller specifications found in the Diamond Drilling Specification Manual. Accordingly, this outline must be read in conjuction with the specification manual.

Use of the Course Outline by Instructors

The instructor should use the course outline as the basis for preparing instruction. The course outline specifies the material that is to be covered in each subject. If there is doubt as to the extent of the lesson, cross-reference can be made to the definitions found in the specification manual.

In most subjects, the standard of knowledge progresses from general to detailed. The skill progression is from limited skill through semi-skilled to skilled. The instructor must be fully acquainted with the meaning of the terms in order to ensure that the students receive training to the proper standard at each level.

The time allocation given to each subject is an indication of the importance of the subject as well as a further indication of the detail to which the subject should be taught. The actual breakdown into 50 minute periods is at the instructor's discretion and in many cases the instructor may choose to combine several subjects and pool the individual periods.

Assessment of the Trainee

Any training course requires some form of confirmation that trainees have learned the skills being taught. There are three essential features of training that must be confirmed. They are:

1. What the trainees are required to do or know (skill or knowledge)
2. Under what conditions the skill or knowledge must be demonstrated
3. To what standard the trainees must perform

The course outline provides the necessary information to answer the above questions. The instructor must carefully read the course outline to ensure that:

1. The subject material is adequately covered
2. The standard achieved by the trainee is properly assessed

In order to assist the instructor in an assessment of the trainee, a sample performance check list is included for the Level 1 Course. This check list contains the following:

- A complete list of the subjects to be taught
- An indication of whether the subject requires skill, knowledge or an assessment
- A value to be assigned to each subject
- The pass standard required

It must be noted that there are some subjects which are not checked by a skill performance or a written test. These subjects are more suitable for an assessment by the instructor based upon participation or continued compliance with the requirements. The assessment will be a pass or fail.

PREREQUISITES FOR DIAMOND DRILLING

General Information

Not everyone is suitable to work in the diamond drilling environment. The average person would either not consider it as a vocation or would not remain for very long. Because of the high cost of training and the limited number of people that can be trained at one time, careful consideration must be taken to ensure that course candidates are aware of the conditions of employment, so that they are more likely to remain in the industry.

In order to screen people who would not remain in the industry, a selection procedure must be used. The purpose of this procedure is to:

1. Improve the retention rate by selecting more suitable candidates.
2. Avoid wasting taxpayer and industry funds on subsistence and training for people who will not remain in the industry.
3. Regulate the flow of new entries to the industry, thus allowing for planned up-grading courses.

The Work Environment

The worker in the diamond drilling industry is subject to harsh working conditions. The driller often works in isolated locations for long periods of time and works in full shifts performing arduous physical labour. The work is hard, dirty, noisy and requires constant vigilence. Protection from the cold of winter and the heat of summer is minimal and at the end of the shift, because of isolation, the worker may not have very desirable relaxation facilities. The worker in this environment must be physically strong, highly motivated and able to accept the hard conditions and long periods of absence from home.

The Worker

Before trainees enrol in the diamond drilling program, the selection committee should make them aware of the actual job function and responsibilities.

The trainees should be aware that they must:

1. Be 18 years of age (minimum).
2. Produce a medical certificate (including an audiometric test) proving that they suffer no physical disabilities that would interfere with carrying out job duties.
3. Demonstrate at least a grade 10 (or equivalent) education.

4. Be prepared to demonstrate the resourcefulness and mechanical ability that is desirable in this occupation.
5. Be prepared to encounter the following:
   - Travel on short notice
   - Shift work (24 hour shift system)
   - Rugged work conditions
   - Acceptance of responsibility and accountability
   - Working in the outdoors during adverse summer and winter conditions
   - Wearing all safety and protective clothing and gear
   - Continual long hours and days of work
6. Work and live well with others in small groups including working with others from different cultural backgrounds.
7. Have the desire to work long and hard toward a predetermined personal objective and company objective.
8. Have the physical stature and endurance required (be capable of repeated lifts of 70 lbs above the shoulders).
9. Have no fear of air travel in small machines or fear of heights.
10. Withstand extended periods of isolation and disruption of family life.
11. Successfully complete a mechanical aptitude test.

The Selection Procedure

Generally, there are four sponsoring groups who may have financial interest and responsibility for the conduct of the Level 1 Course. They are:

1. Canada Employment and Immigration Commission (formerly Canada Manpower)
2. Ministry of Education, Province of British Columbia
3. Western Diamond Drilling Contractors Association
4. Drilling companies

Any selection procedure must ensure that the interests of all groups are met in a fair and equitable manner and that only candidates who are deemed trainable and able to work in the industry will be selected.

In order to achieve this aim a person or committee authorized by the course-sponsoring groups will review all applications and notify applicants and sponsors of rejection or acceptance. In the event that there are more applicants than course vacancies, acceptance will be initially based on whether or not the applicant meets the minimum requirements and then, in order of priority:

1. The date of application
2. The needs of a particular sponsor
3. The outstanding qualities or qualifications of the applicant

If a sponsor or applicant has cause to dispute a rejection a review board consisting of one member from each of the sponsoring groups will convene to decide by interview, discussion and majority vote what action, if any, will be taken. In the event that there are considerably more applicants than course vacancies, it may be effective to convene a review board to conduct all the selection and notification procedures.

Sequence of Events for Courses

1. Advertise the course through industry circulars, the media, college and institute calendars, and Canada Employment and Immigration centres.
2. Distribute information and applications to all interested parties.
3. Accept applications and identify potential candidates.
4. Select candidates to the limit of the class capacity and notify them (and their sponsors) of their acceptance or rejection, or to appear before the review board.
5. In the event of a dispute or excessive registration, convene a review board to make the final selection or decision.

CERTIFICATION PROCEDURE FOR NON-GRADUATES

General Information

In order to achieve a common, measurable standard for the qualification of diamond drillers in western Canada, a certification procedure based upon the Diamond Driller Specifications has been adopted. This procedure is designed to evaluate and award a certification level to those drillers who have not graduated from a Western Diamond Drilling Contractors Association course. The steps to be taken are as follows:

Procedure		Action by
1. Applicants are given advice and information regarding the certification procedure.		Union
2. Completion of the application forms: a. Level 1 & 2 applicants	b. Level 3 & 4 applicants	Applicant
3. a. Review of the application by the WDDCA and award of certification	b. Review of the application and award of certification by a review board	WDDCA or Review Board
4. Disputed cases are reviewed by a review board who will rule on certification		

Initial Contact

Initial contact and explanation of the certification program is made by the Tunnel and Rockworkers Union. The union forwards sufficient information to guide the applicant in the preparation of his application. This information consists of:

1. A letter of introduction explaining the program
2. A Certification Application form
3. A Certification Questionnaire

Submission of Application and Notification

The Tunnel and Rockworkers Union assembles the completed documents and submits them with comments to the Western Diamond Drilling Contractors Association. Upon receipt, the Western Diamond Drilling Contractors Association reviews the documents, checks references, convenes review boards and conducts any other steps necessary to fully assess the applications. When the assessment is complete, the Western Diamond Drilling Contractors Association advises the union of the results and the union advises the applicant.

Documentation

In order to standardize the applications and to ensure that sufficient information is received to allow a proper evaluation, the following documents are to be used:

1. WDDCA-1: Certification Application
2. WDDCA-2: Certification Questionnaire

The Certification Questionnaire is included on the following pages.

Review Board

In the case of applicants who are assessed to be at the 3rd or 4th level, the Western Diamond Drilling Contractors Association convenes a review board to examine the applicants' documents and if necessary interview them. The review board is the authority for award of Levels 3 and 4. Decisions of the review board are by majority opinion and are final. Composition of the review board is:

1. A WDDCA appointed member
2. A union appointed member
3. An employer (not associated with the applicant) who is appointed by agreement of the WDDCA and union members.

A review board composed of the above is also convened to rule on any disputed Level 1 or Level 2 assessments.

WESTERN DIAMOND DRILLING CONTRACTORS ASSOCIATION

CERTIFICATION QUESTIONNAIRE

Name ______________________________ Social Ins. No. ______________

Present Address ______________________ Telephone No. ______________

______________________________________ Date ______________

NOTE

The purpose of this questionnaire is to evaluate the experience of applicants who have not progressed through the four levels of WDDCA courses. Accordingly, the questionnaire is used to determine whether an applicant is recommended for Level 1, Level 2, Level 3 or Level 4. An experienced, knowledgeable driller should answer all questions including many that he may consider basic. In addition, less experienced drillers must bear in mind that they are not expected to answer all questions.

In order that experience can be verified, applicants must provide as much information on dates, employers and supervisors as possible.

RECORD OF EDUCATION

School	Course of study	Years attended		Circle last year completed
		From	To	
Elementary				5 6 7 8
High				9 10 11 12
University or Technical				1 2 3 4
WDDCA Courses				
Other (specify)				

WORK EXPERIENCE

Company Phone number

Address

Location	From	To	Size of hole, depth & ground type	no. of drills	Supervisor

Company Phone number

Address

Location	From	To	Size of hole, depth & ground type	no. of drills	Supervisor

Company Phone number

Address

Location	From	To	Size of hole, depth & ground type	no. of drills	Supervisor

Company Phone number

Address

Location	From	To	Size of hole, depth & ground type	no. of drills	Supervisor

List your experience using the following techniques (check appropriate level).

	no experience	participated	supervised or participated without supervision	when and where
Locate and lay out a campsite				
Erect camp structures				
Erect camp facilities				
Set up radio equipment				
Operate radio equipment				
Select and prepare routes to a drill				
Construct foundations				
Position & anchor the drill				
Erect the floor & shack				
Erect derrick, mast & basket				
Locate & install a water system				
Construct a heliport				
Construct aircraft ramp or dock				
Install water line pumps				
Install heaters				
Set up a mud system				
Winterize equipment				
Overburden drilling				
Casing the overburden				
Recover casing				
Reaming				
Drill with lost circulation				
Drill with reverse circulation				
Use air & foam				
Hole survey				
Control drilling				
Recover sludge samples				
Recover soil samples				
Fishing				
Drilling in permafrost				
Setting up on ice				
Set blow-out preventers				
Cement & cap a hole				
Triple tube coring				
Underground drilling				
Grouting				

State the specific types of the following equipment you have used and your level of knowledge (basic or thorough).

Size of the drilling equipment? ____

Model of diamond drills? ____

Diamond products used? ____

Detail your experience in setting wedges.

Where and when? ____

What types? ____

Extent of your participation? ____

Are you familiar with the proper use of the following mechanical aids?

cables	yes	____	no	____	anchorages	yes	____	no ____
chains	yes	____	no	____	tower supports	yes	____	no ____
jacks	yes	____	no	____	running blocks	yes	____	no ____

State what blasting methods and blasting materials you are capable of using.

State what drill hydraulic repairs you feel you are capable of and state any experience.

State what diesel engine repairs you feel you are capable of and state any experience.

State what kind of cutting and welding tasks you have been required to perform.

State what electrical fault finding and repairs you feel you are capable of performing and state any experience (include both camp wiring and engine wiring).

State your experience in equipment repair (hydraulic chuck, head, transmission, wire line hoists, pumps, trucks, etc.).

Are you capable of setting up the facilities and caring for the sick and injured?

yes no

Specify what First Aid training you have had and list the Certificate(s) you hold.

Which union(s) do you belong to and what is the membership date?

Specify the experience you have had recovering rods or casing stuck:

in sand cave or mud

as a result of a burnt bit

as a result of a dropping

State your experience in removing casing by the use of hammer, casing cutter or blasting.

State your experience in drilling out a bit or other object left in a hole or through a stuck core barrel.

State your experience in thawing frozen water lines.

List your supervisory experience in diamond drilling.

Are you familiar with the following work organization techniques?

Critical Path	yes	no
Gantt (bar) Chart	yes	no
Progress Reports	yes	no

State briefly what experience you have had in:

client relations

work supervision

production supervision

training others

participation in meetings

Briefly explain a suggestion you have made for improvement of procedures or equipment.

Have you been responsible for the following?

Compensation forms	yes	no	Union forms	yes	no
Purchase orders	yes	no	Daily time sheets	yes	no
Accident forms	yes	no	Weekly time sheets	yes	no

List what experience you have had with inventory, storing, checking and reordering of equipment.

Project	Type of experience	Magnitude of Job

Specify rock formations you have encountered and the bits selected for drilling.

Where	Rock Formation	Bit Selected

DIAMOND DRILLING
SPECIFICATION MANUAL

LEVEL 1 SPECIFICATIONS

1: TERMINOLOGY, COMMUNICATIONS AND EMPLOYMENT IN THE DIAMOND DRILLING INDUSTRY

	Skill Requirements		Knowledge Requirements
1.	n/a	1.	Gain a detailed knowledge of the historical development of the diamond drilling industry and its contribution to economic development.
2.	n/a	2.	Gain a detailed knowledge of career potential in the industry including: . Classification and certification . Training programs . WDDCA
3.	n/a	3.	Gain a detailed knowledge of the requirements for personal and social development, the effect of time and distance on personal life and the need to maintain a good public image.
4.	n/a	4.	Gain a detailed knowledge of the proceedings for arranging personal gear.
5.	n/a	5.	Gain a basic knowledge of company and employee goals.
6.	n/a	6.	Gain a basic knowledge of the need for confidentiality.
7.	n/a	7.	Gain a basic knowledge of the importance of observing and assessing job improvements.
8.	n/a	8.	Gain a detailed knowledge of proper drilling terminology.
9.	n/a	9.	Gain a basic knowledge of rock characteristics and formations.
10.	Demonstrate a skilled ability to receive industry-related instructions.	10.	Gain a basic knowledge of the methods of communication used in the industry including communications with: . Supervisors . Clients . Cross shift workers . Helpers and co-workers
11.	Demonstrate a semi-skilled ability to communicate effectively using a radio telephone.	11.	Gain a detailed knowledge of radio telephone procedures.
12.	n/a	12.	Gain a detailed knowledge of the description and characteristics of the diamond drill and its components.

2: SAFETY AND GOOD WORK HABITS

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to administer first aid techniques.	1. Gain a detailed knowledge of elementary first aid with an emphasis on industrial injuries, survival techniques in extreme weather conditions and personal care.
2. Demonstrate a skilled ability to use fire fighting equipment.	2. Gain a detailed knowledge of the hazards, regulations and control of dangerous and flammable materials.
3. n/a	3. Gain a basic knowledge of the principles of environment and wildlife protection.
4. n/a	4. Gain a detailed knowledge of safe work habits to include: . A clean and orderly work site . Safe travel on ice and water . Safety in a blasting area . Moving safely near helicopters and aircrafts . Recognition and reporting of unsafe working conditions
5. Demonstrate a skilled ability to select and wear safety apparel.	5. Gain a detailed knowledge of the use of safety apparel.
6. Demonstrate a skilled ability to safely use industry-related hand and power tools.	6. Gain a detailed knowledge of hand and power tools used in the industry.
7. Demonstrate a skilled ability to safely use cables, chains and sprockets.	7. Gain a detailed knowledge of working safely with cables, chains and sprockets.
8. Demonstrate a skilled ability to maintain tools and equipment.	8. Gain a detailed knowledge of caring for tools and equipment.

3: MOBILIZATION AND DEMOBILIZATION

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to load and unload vehicles.	1. Gain a basic knowledge of the principles of loading and unloading vehicles including: . Weight distribution . Safe packing . Sequence . Tying down
2. Demonstrate a skilled ability to load and unload aircraft, helicopters and barges.	2. Gain a detailed knowledge of the principles of loading and unloading aircraft, helicopters and barges.

4: SET UP AND TEAR DOWN CAMP AND CAMP EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to erect camp structures.	1. Gain a basic knowledge of the methods of erecting camp structures.
2. Demonstrate a limited ability to assemble and erect camp facilities.	2. n/a

5: MOVE EQUIPMENT TO SITE

Skill Requirements	Knowledge Requirements
1. Have a semi-skilled ability to check out oil and fuel systems.	1. Gain a basic knowledge of the procedures for checking oil and fuel systems.

6: SETTING UP AND DISMANTLING DRILLING EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to construct foundations using: . Bare ground . Wooden sills . Cement . Logs . Cribbing	1. Gain a basic knowledge of site clearance and foundation construction.
2. Demonstrate a semi-skilled ability to perform the procedures for anchoring the drill.	2. Gain a basic knowledge of the requirement for anchoring the drill.
3. Demonstrate a skilled ability to erect the floor and drill shack.	3. Gain a detailed knowledge of erecting the floor and drill shack.
4. Demonstrate a semi-skilled ability to perform the procedures for erecting and using derricks, masts and baskets.	4. Gain a basic knowledge of the use and erection of derricks, masts and baskets.
5. Demonstrate a semi-skilled ability to perform the procedures for installing water line pumps and heaters.	5. Gain a basic knowledge of locating and installing water line pumps and heaters.
6. Demonstrate a semi-skilled ability to perform the procedures for setting up a mud system.	6. Gain a basic knowledge of setting up a mud system in accordance with available equipment and regulations.
7. Demonstrate a skilled ability to perform proper mud mixing techniques.	7. Gain a detailed knowledge of mud mixing.
8. n/a	8. Gain a basic knowledge of the requirements, preparation and set up for fluids and lubricants.
9. Demonstrate a semi-skilled ability to perform the procedures for tear down.	9. Gain a basic knowledge of tear down, moving and storage (including pulling rods and casing) storage and planning moves.

7: OPERATION AND MAINTENANCE OF SUPPORT EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to operate and maintain fixed equipment and a limited skilled ability to operate and maintain support equipment.	1. Gain a basic knowledge of the operation and maintenance of support equipment including: . Gas and diesel engines . Propane equipment . Compressors . Trucks . Water trucks . Motor boats . Fuel storage containers . Cats and skidders . Muskegs and skidoos

8: ASSEMBLE AND MAINTAIN DRILLING TOOLS

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to assemble and maintain core barrels.	1. Gain a basic knowledge of the assembly and maintenance of core barrels.
2. Demonstrate a semi-skilled ability to assemble and maintain diamond tools.	2. Gain a basic knowledge of the assembly and maintenance of diamond tools.
3. Demonstrate a semi-skilled ability to assemble and maintain surface tools.	3. Gain a basic knowledge of the assembly and maintenance of surface tools.

9: OPERATE DRILL EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to start and stop the drill and pump.	1. Gain a detailed knowledge of the procedures for starting and stopping the drill and pump.
2. Demonstrate a semi-skilled ability to start pump rotation and feed.	2. Gain a basic knowledge of the steps required to start pumping, rotation and feed.
3. n/a	3. Gain a basic knowledge of overburden drilling.
4. n/a	4. Gain a basic knowledge of casing the overburden.
5. Demonstrate a skilled ability to handle and store the core.	5. Gain a detailed knowledge of the proper handling and storage of the core.
6. Demonstrate a semi-skilled ability to start coring procedures.	6. Gain a basic knowledge of starting coring procedures.
7. Demonstrate a skilled ability to retrieve the core.	7. Gain a detailed knowledge of retrieving the core.
8. Demonstrate a skilled ability to hoist and lower rods.	8. Gain a detailed knowledge of the hoisting and lowering of rods.

10: APPLY SPECIFIC DRILLING TECHNIQUES

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a basic knowledge of permafrost techniques.
2. Demonstrate a limited ability to cement and cap a hole.	2. Gain a basic knowledge of cementing and capping a hole.
3. Demonstrate a limited ability to perform the methods of hole survey.	3. Gain a basic knowledge of the methods of conducting hole survey.
4. n/a	4. Gain a basic knowledge of the methods used to recover sludge samples.

11: HELICOPTER AND FIXED WING USAGE

Skill Requirements	Knowledge Requirements
1. Demonstrate a semi-skilled ability to construct and maintain a heliport.	1. Gain a limited knowledge of the contruction and maintenance of a heliport.
2. Demonstrate a semi-skilled ability to construct ramps and docks.	2. Gain a basic knowledge of the contruction of docks and ramps for fixed wing aircraft.
3. Demonstrate a skilled ability to use signals.	3. Gain a detailed knowledge of the use of signals.
4. Demonstrate a skilled ability to safely use nets and slings.	4. Have a detailed knowledge of nets and slings.

12: FIELD TRIPS

During the course at least one field trip should be conducted in order to broaden the trainee's knowledge and understanding of the industry. If possible, this trip should include a visit to a working drill where the trainee will observe the pace of the work and recognize the importance of developing instinctive skills and teamwork.

Suggested visits are:

1. A working drill site
2. A drilling company shop or yard
3. A diamond bit manufacturer
4 A helicopter company

LEVEL 2 SPECIFICATIONS

1: TERMINOLOGY, COMMUNICATIONS AND EMPLOYMENT IN THE DIAMOND DRILLING INDUSTRY

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of company and employee goals.
2. n/a	2. Gain a detailed knowledge of the importance and methods of observing, assessing and suggesting job improvements.
3. n/a	3. Gain a detailed knowledge of rock characteristics and formations including bit selection.
4. Demonstrate a skilled ability to receive and deliver industry-related instructions.	4. Gain a detailed knowledge of commucation in the industry including communications with: . Supervisors . Operators of support equipment . Clients . Cross shift workers . Helpers and co-workers
5. n/a	5. Gain a basic knowledge of the way a meeting is conducted and how to participate and present information.
6. n/a	6. Gain a detailed knowledge of the completion of progress proformas.
7. n/a	7. Have a basic knowledge of the completion of accident reports.

2: SAFETY AND GOOD WORK HABITS

Skill Requirements	Knowledge Requirements
1. n/a	1. Cultivate safe work habits.

3: MOBILIZATION AND DEMOBILIZATION

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a basic knowledge of mobilization and demobilization including: . Instructions . Checklists . Travel details . Routes and carriers
2. n/a	2. Gain a detailed knowledge of the principles of loading and unloading vehicles.
3. Demonstrate a skilled ability to take an inventory and check equipment.	3. Gain a basic knowledge of inventory, storing, and checking and re-ordering equipment.

4: SET UP AND TEAR DOWN CAMP EQUIPMENT

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a basic knowledge of the location, layout and preparation of a campsite.
2. Demonstrate a skilled ability to erect camp structures.	2. Gain a detailed knowledge of the erection of camp structures.
3. Demonstrate a semi-skilled ability to assemble and erect camp facilities.	3. Gain a basic knowledge of the layout and erection of camp facilities including: . Water . Fire protection . Sanitary system . Heating . Tools
4. Demonstrate a semi-skilled ability to set up radio equipment.	4. Gain a basic knowledge of setting up radio equipment.
5. Demonstrate a semi-skilled ability to perform the techniques of winterizing.	5. Gain a basic knowledge of winterizing the camp and equipment.
6. Demonstrate a skilled ability to perform the procedures for the dismantling and cleanup of the camp and camp equipment.	6. Gain a basic knowledge of procedures for the dismantling and cleanup of the camp and camp equipment.

5: MOVE EQUIPMENT TO SITE

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a basic knowledge of selecting, locating and preparing routes to camp and drill sites.
2. n/a	2. Gain a basic knowledge of moving drills from the off-load site to the drill site.
3. n/a	3. Gain a basic knowledge of the location and installation of the water system for the camp.
4. Demonstrate a skilled ability to check oil, fuel, water and hydraulic systems.	4. Gain a detailed knowledge of the procedures for checking oil, fuel, water and hydraulic systems.

6: SETTING UP AND DISMANTLING DRILLING EQUIPMENT

	Skill Requirements		Knowledge Requirements
1.	Demonstrate a semi-skilled ability to locate the collar of a drill hole.	1.	Gain a basic knowledge of the various means of locating the drill hole and interpreting the stake markings.
2.	Demonstrate a skilled ability to construct foundations using: . Bare ground . Wooden sills . Cement . Logs . Cribbing . Ice	2.	Gain a detailed knowledge of site clearance and foundation construction.
3.	Demonstrate a semi-skilled ability to locate the drill on the foundation in line with the backsight and frontsight.	3.	Gain a detailed knowledge of positioning the drill on the foundation in line with the backsight and frontsight.
4.	Demonstrate a skilled ability to locate and install water line pumps and heaters.	4.	Gain a detailed knowledge of locating and installing water line pumps and heaters.
5.	Demonstrate a skilled ability to set up a mud system.	5.	Gain a detailed knowledge of setting up a mud system in accordance with equipment on hand and regulations.
6.	n/a	6.	Gain a detailed knowledge of erecting the floor and drill shack.
7.	Demonstrate a skilled ability to erect and use derricks, masts and baskets.	7.	Gain a detailed knowledge of the use and erection of derricks, masts and baskets including the advantages and disadvantages.
8.	Demonstrate a skilled ability to perform the procedures for teardown.	8.	Gain a detailed knowledge of the procedures for tear-down and move and storage including pulling rods and casing, servicing, storage and planning moves.

7: OPERATION AND MAINTENANCE OF SUPPORT EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to operate and maintain fixed equipment and a semi-skilled ability to operate and maintain mobile equipment.	1. (a) Gain a detailed knowledge of the operation and maintenance of fixed equipment including: . Gas and diesel engines . Propane equipment . Compressors . Fuel storage containers . Generators (b) Gain a detailed knowledge of the operation and maintenance of mobile equipment including: . Water trucks . Motor boats . Cats and skidders . Muskegs and skidoos . Trucks
2. Demonstrate a semi-skilled ability in the operation and maintenance of camp water systems and pumps.	2. Gain a basic knowledge of the operation and maintenance of the camp water system and pump units.

8: ASSEMBLE AND MAINTAIN DRILLING TOOLS AND HAND TOOLS

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to operate impregnated and diamond bit sets.	1. Gain a basic knowledge of diamond bit selection and running parameters.
2. Demonstrate a skilled ability to assemble and maintain down hole tools.	2. Gain a detailed knowledge of the assembly and maintenance of down hole tools to include: . Overburden tools . Coring tools
3. Demonstrate a skilled ability to assemble and maintain surface tools.	3. Gain a detailed knowledge of the assembly and maintenance of surface tools.
4. Demonstrate a skilled ability to maintain diamond tools.	4. Gain a detailed knowledge of the assembly and maintenance of diamond tools.

9: OPERATE DRILL EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to operate the drill.	1. Gain a detailed knowledge of the operation of the drill.
2. Demonstrate a skilled ability to perform overburden drilling.	2. Gain a detailed knowledge of overburden drilling.
3. Demonstrate a skilled ability to case the overburden.	3. Gain a detailed knowledge of casing the overburden.
4. Demonstrate a skilled ability to start coring procedures.	4. Gain a detailed knowledge of starting coring procedures.
5. n/a	5. Gain a basic knowledge of the meaning and interpretation of orders regarding stopping hole.

10: FLUIDS AND LUBRICANTS

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of the requirements, preparation and set up for fluids and lubricants.
2. Demonstrate a skilled ability to work using the mud technique.	2. Gain a detailed knowledge of the mud technique.
3. Demonstrate a skilled ability to work using water and rod greases.	3. Gain a detailed knowledge of the use of water and rod greases.
4. Demonstrate a limited ability to work using air and foam.	4. Gain a basic knowledge of the use of air and foam.

11: APPLY SPECIFIC DRILLING TECHNIQUES

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to cement, grout and cap a hole.	1. Gain a detailed knowledge of cementing, grouting and capping a hole.
2. Demonstrate a limited ability to apply reaming techniques.	2. Gain a basic knowledge of reaming techniques.
3. Demonstrate a limited ability to apply fishing techniques.	3. Gain a basic knowledge of how to apply fishing techniques.
4. Demonstrate a skilled ability to drill with lost circulation.	4. Have a detailed knowledge of drilling with lost circulation (excessive water flow).
5. n/a	5. Gain a detailed knowledge of drilling through faults.
6. Demonstrate a skilled ability to perform in the methods of hole survey.	6. Gain a detailed knowledge of the methods of hole survey.
7. Be semi-skilled in the procedures for setting wedges.	7. Gain a basic knowledge of setting wedges.
8. n/a	8. Gain a detailed knowledge of applying control drilling techniques.
9. Demonstrate a semi-skilled ability to set up and maintain blow-out preventers.	9. Gain a basic knowledge of setting up and maintaining blow-up preventers.
10. n/a	10. Gain a basic knowledge of drilling using reverse circulation.
11. n/a	11. Gain a detailed knowledge of recovering sludge samples.
12. n/a	12. Gain a basic knowledge of taking soil samples.
13. Demonstrate a skilled ability to perform the techniques of casing recovery.	13. Gain a detailed knowledge of casing recovery.
14. n/a	14. Gain a basic knowledge of the triple tube coring technique.

12: HELICOPTER AND FIXED WING USAGE

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to perform the procedures for the construction and maintenance of a heliport.	1. Gain a detailed knowledge of the construction and maintenance of a heliport.
2. Demonstrate a skilled ability to perform the procedures for the construction of docks and ramps.	2. Gain a detailed knowledge of constructing a dock or ramp for fixed wing aircraft.

13: EQUIPMENT REPAIRS

Skill Requirements	Knowledge Requirements
1. Demonstrate a limited ability to conduct minor repairs on a hydraulic system.	1. Gain a basic knowledge of hydraulic systems as applied to drilling equipment.
2. Demonstrate a limited ability to conduct elementary repairs on a diesel engine.	2. Gain a basic knowledge of elementary diesel engine repairs.
3. Demonstrate a limited ability to perform cutting and welding tasks.	3. Gain a basic knowledge of cutting and welding techniques.
4. Demonstrate a limited ability to conduct minor repairs of electrical systems.	4. Gain a basic knowledge of electrical fault finding and repairs as applied to motors and camp electrical systems.

LEVEL 3 SPECIFICATIONS

1: TERMINOLOGY, COMMUNICATIONS AND EMPLOYMENT IN THE DIAMOND DRILLING INDUSTRY

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of the need for confidentiality as applied to cost of operations and bidding.
2. n/a	2. Gain a detailed knowledge of the reasons and objectives for different drilling strategies.
3. n/a	3. Gain a detailed knowledge of the preparation of progress reports and a basic knowledge of the principles of writing notes, letters and memos.
4. n/a	4. Gain a detailed knowledge of completing accident reports.

2: SAFETY AND GOOD WORK HABITS

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to set up patient care facilities.	1. Gain a detailed knowledge of the procedures for temporary care of the sick and injured.
2. n/a	2. Gain a detailed knowledge of the principles of environment and wildlife protection, including regulations.
3. n/a	3. Gain a detailed knowledge of the calculation of safe working loads and other safety factors applying to the use of cables, chains, ropes, sprockets and jacks.

3: MOBILIZATION AND DEMOBILIZATION

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of mobilization instructions to include: . Instructions . Checklists . Routes and carriers . Travel details
2. n/a	2. Gain a detailed knowledge of the procedures for inventory, storing, checking and reordering equipment.

4: SET UP AND TEAR DOWN CAMP EQUIPMENT

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of the location, layout and preparation of a campsite.
2. Demonstrate a skilled ability to assemble and erect camp facilities.	2. Gain a detailed knowledge of the layout and erection of camp facilities including: . Water . Fire protection . Sanitary system . Heating
3. Demonstrate a skilled ability to set up radio equipment.	3. Gain a detailed knowledge of setting up radio equipment.
4. Demonstrate a skilled ability to perform the techniques of winterizing.	4. Gain a detailed knowledge of winterizing the camp and equipment.
5. Demonstrate a skilled ability to dismantle and clean up the camp and camp equipment.	5. Gain a detailed knowledge of dismantling and clean up of the camp and camp equipment.

5: MOVE EQUIPMENT TO SITE

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of selecting, locating and preparing routes to camps and drill sites.
2. n/a	2. Gain a detailed knowledge of moving drills from the offload site to the drill site.
3. n/a	3. Gain a detailed knowledge of the procedures for locating and installing the water system.

6: SETTING UP AND DISMANTLING DRILLING EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to locate the collar of the drill hole.	1. Gain a detailed knowledge of the methods of locating the drill hole and interpreting stake markings.

7: OPERATION AND MAINTENANCE OF SUPPORT EQUIPMENT

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to operate and maintain drill water system and pumps.	1. Gain a detailed knowledge of the operation and maintenance of the drill water systems and pumps.
2. Demonstrate a skilled ability to make up and place a simple blasting charge.	2. Gain a detailed knowledge of the safe use of explosives.

8: FLUIDS AND LUBRICANTS

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of the procedures of advanced mud techniques.
2. Demonstrate a skilled ability to work using air and foam.	2. Gain a detailed knowledge of the use of air and foam.

9: APPLY SPECIFIC DRILLING TECHNIQUES

Skill Requirements	Knowledge Requirements
1. n/a	1. Gain a detailed knowledge of permafrost techniques.
2. Demonstrate a skilled ability to apply reaming techniques.	2. Gain a detailed knowledge of reaming techniques.
3. Demonstrate a skilled ability to apply fishing techniques.	3. Gain a detailed knowledge of fishing techniques.
4. Demonstrate a skilled ability to drill with lost circulation.	4. Gain a detailed knowledge of drilling with lost circulation (excessive water flow).
5. Demonstrate a skilled ability to set wedges.	5. Gain a detailed knowledge of setting wedges.
6. Demonstrate a skilled ability to set and maintain blow-out preventers.	6. Gain a detailed knowledge of setting up and maintaining blow-out preventers.
7. n/a	7. Gain a detailed knowledge of drilling using reverse circulation.
8. n/a	8. Gain a detailed knowledge of drilling using reverse circulation.
9. Demonstrate a skilled ability to take soil samples.	9. Gain a detailed knowledge of soil sampling.
10. n/a	10. Gain a detailed knowledge of the triple tube technique.

10: EQUIPMENT REPAIRS

Skill Requirements	Knowledge Requirements
1. Demonstrate a skilled ability to conduct minor repairs on a hydraulic system.	1. Gain a detailed knowledge of hydraulics as applied to drilling equipment.
2. Demonstrate a skilled ability to conduct elementary repairs on a diesel engine.	2. Gain a detailed knowledge of elementary diesel engine repairs.
3. Demonstrate a skilled ability to perform cutting and welding tasks.	3. Gain a detailed knowledge of cutting and welding techniques.
4. Demonstrate a skilled ability to conduct minor repairs on electrical systems.	4. Gain a detailed knowledge of electrical fault finding and repairs as applied to motors and camp electrical systems.

LEVEL 4 SPECIFICATIONS OUTLINE

1. Gain a detailed knowledge of the principles of environment and wildlife protection.

2. Safety inspections, regulations and safety committees.

3. Administration and office procedures
    - How to conduct a meeting
    - Preparation of reports, memos and correspondence

4. The drill supervisor's responsibilities
    - Stopping of hole
    - Standard of work
    - Client relations

5. Organization of work
    - Critical path
    - Gantt chart
    - Resource planning and leveling
    - Analysis and decision making

6. Supervisory skills
    - Instructions
    - Techniques of control
    - Motivation
    - Delegation of responsibility
    - How to train others

7. The structure and operation of drilling companies
    - Corporate structure of drilling companies and client companies
    - Economics and bidding processes of a drilling company

DIAMOND DRILLING
COURSE OUTLINE

LEVEL 1 COURSE OUTLINE

General Description and Aim

The Level 1 Course is designed to take candidates with little or no knowledge of diamond drilling and give them sufficient knowledge and skills to participate safely and effectively as a helper on the job.

The Level 1 Course is designed to be conducted in 8 weeks and 3 days. This time allocation allows for two statutary holidays during the course. If required, the course can be modified to 7 weeks and 4 days by careful reduction of time allocations. Such a modification will not greatly sacrifice training value but must be considered as the minimum training time.

Class Limit and Instructor Requirements

Level 1 training calls for one full-time instructor and a class limit of 16 students. During the course it is desirable to have an assistant instructor (during the most intensive period involving setting up and operating pumps and drill (3 weeks)), as well as guest instructors to cover the following:

- First aid – survival first aid (one day)
  advanced first aid (three days)
- Fire fighting – lecture and demonstration (half-day)
- Radio telephone – one period
- Support equipment – 4 WD trucks (half-day)
- Geology – two periods
- Helicopter – two periods

Facilities Requirements

The ideal location for conducting Level 1 training is a college or institute such as the Pacific Vocational Institute. Such a facility can normally provide the following essential requirements:

- Lecture room for 14 personnel
- Desks and chairs for students and instructor
- Chalk board, chalk and erasers
- Instructor office
- Overhead projector and screen
- Storage facilities
- Work area for drilling

In addition to the essential facilities, a college or institute offers other features which will make the course either more interesting or more effective. These considerations are:

- Availability of other lecture equipment (projectors and packaged lectures)
- Availability of guest lecturers
- Availability of specified support equipment (dozers, trucks, helicopters, boats, skiddoos, etc.)
- Administrative facilities (typing and copying)
- Amenities (cafeteria, lounge, etc.)
- Accommodation and feeding of students
- Ease of supply and replacement of equipment and consumables
- Ease of transportation from the class area

Equipment Requirements

The following equipment is required to be on the site prior to the start of the course:

Item	Quantity
"435" pump, diesel motor, chain drive	1
"435" pump, single cyl., diesel, transmission drive	1
"435" pump, bare	1
pump tool kit	1
flexible exhaust pipe	
pumptree	
suction hoses (25')	2
foot valve and strainer	1
pump pressure gauge	2
pressure relief valve	2
mud pit	
mud mixers	2
rubber hose (1" c/w 3 clamp masters clamps and assorted couplings	600 ft
victaulic pipe c/w 12 connectors 2-victaulic/1" hose connectors	200 ft

Item	Quantity
water swivels c/w 25' hose and packing material	2
mud funnel c/w 15' hose	1
large assortment of pipe fittings	
NQ corebarrel complete	10 ft
NQ starting barrel complete	2 ft
NQ inner tubes complete (10')	3
NQ core lifter cases	4
NQ core lifter springs	4
NQ overshot and dry hole release	1
NQ inner tube wrenches	2
NQ rods	30
API rods	6
NW casing (2') c/w tee joint	5
NW casing (5')	3
NW casing (10')	5
NQ hoisting plugs	2
large assortment adapter subs	
R.H. spear tap	1
FM - SW radio c/w antenna	2
chemical fire extinguisher	2
first aid kit (No. 2)	2
heavy-duty chain come-along	1
Boyles Bros. type foot clamp c/w NQ and NW jaws	1
foot clamp base plate	1
pipe wrench 36"	3
pipe wrench 24"	3
pipe wrench 18"	3
snatch block (6")	1
nico-press clamp master and clamps	1
Baroid type mud test kit	1
resin c/w heating spoon	2 lb
NQ brush - rod joint lube	1

Item	Quantity
clinometer c/w test tubes, corks, 4% acid	1
250 lb jar hammer c/w staff and adapters	1
safety belt	1
4' x 4' rubber rod mat	1
Longyear 44 skid mounted, unitized shack, 3' hydraulic swivel head "N" hydraulic chuck, NQ & NW jaws, 20' mast, basket and slide	1

WESTERN DIAMOND DRILLING CONTRACTORS ASSOCIATION

LEVEL 1 COURSE

PERFORMANCE CHECK LIST

NAME ______________________ COURSE DATE ______________________ INSTRUCTOR ______________________

SUBJECT	SKILL			KNOWLEDGE			ASSESSMENT			REMARKS (see back for additional remarks)
	possible	pass	mark	possible	pass	mark	pass	fail		
Career potential in the industry				10	8					
The requirement for personal and social development	–	–	–	–	–	–				
Procedures for arranging personal gear	–	–	–	–	–	–				
Company and employee goals	–	–	–	–	–	–				
The need for confidentiality	–	–	–	–	–	–				
Observing, assessing and suggesting job improvements				5	3					
Diamond drilling terminology				10	8					
Rock characteristics and formations				10	6					
Communicating in the work environment	–	–	–	–	–	–				
Communicating effectively using radio telephone	10	8		5	4					
Description and characteristics of the diamond drill				10	8					
Elementary first aid	70	55		70	55					
Dangerous and flammable materials				5	4					
Using fire fighting equipment	10	8								
Environment and wildlife protection				5	3					
Safe work habits				10	9					
Select and wear proper safety apparel				5	4					
Use of hand and power tools	50	30		20	15					
Working safely with cables, chains, ropes and sprockets	20	15		15	10					
Maintenance and care of tools and equipment	10	7		10	7					
Loading and unloading vehicles	15	9								
Loading and unloading aircraft, helicopters and barges	4	2		6	3					
Erection of camp structures	50	35		20	12					
Assembly and erection of camp facilities	–	–	–	–	–	–				
Checking oil and fuel systems	6	5		4	3					
Site clearance and drill foundation construction	25	18		10	6					
Anchoring the drill	3	2		2	1					
Erecting the floor and drill shack	40	30		15	10					
Erection of derricks, masts, baskets and slides	20	15		15	10					
Installing water line pumps and heaters	50	45		20	15					
Setting up a mud system	10	8		5	3					
Mud mixing	15	12		5	3					
Preparation and set up for fluids and lubricants				10	6					
Tear down and move/storage	25	15		15	10					
Operation and maintenance of support equipment	60	40		30	20					
Assembly and maintenance of core barrels	20	12		15	9					
Assembly and maintenance of diamond tools	15	9		5	3					
Assembly and maintenance of surface tools	15	9		5	3					
Starting and stopping the drill and pump	20	12								
Starting and stopping drill rotation and feed	15	8								
Overburden drilling				10	5					
Casing the overburden				10	5					
Proper handling and storage of the core	3	2		2	1					
How to start coring procedures	40	20		15	8					
How to retrieve the core	40	20		15	8					
Hoisting and lowering rods				15	9					
Permafrost techniques				5	3					
Cementing and capping a hole				20	10					
Methods of hole survey				15	8					
Recovery of sludge samples				5	3					
Construction and maintenance of a heliport	3	2		2	1					
Construction of docks and ramps for fixed wing aircraft	3	2		2	1					
Use of signals when working with aircraft	5	3								
Using nets and slings with helicopters	5	3								
TOTALS	677	461		488	323					

SUGGESTED WEEKLY TIMETABLE FOR WEEK 1

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Historical development of diamond drilling Career potential in the industry	First aid	Requiremant for personal & social development Arranging personal gear Knowledge of company and employee goals Knowledge of the need for confidentiality	Diamond drilling terminology Characteristics of the diamond drill and its components	Observing, assessing and suggesting job improvements Communicating in the work environment Using the radio telephone Environment and wildlife protection
SUBJECTS (PM)	Safe work habits Select and wear proper safety apparel	First aid	Load and unload vehicles	Hazards, regulation and control of dangerous and flammable materials	Hand and power tools Administration
COURSE OUTLINES	A1,A2,B4,B5	B1	A3,A4,A5,A6,C1	A8,A12,B2,B2a,B2b	B6,A11
MATERIALS	Safety apparel	First aid instruction material	Specified materials Loaded vehicles	Loaded vehicles Specified materials	Communication Eqpt Hand and power tools
REMARKS	Period 3&4 requires a panel of: employer union rep WDDTA rep	This is only the "survival first aid" portion	Course equipment could be used as the lesson	Possible instruction by the fire department	Radio supplier rep

SUGGESTED WEEKLY TIMETABLE FOR WEEK 2

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Use of hand and power tools	Use of hand and power tools	Maintenance and care of tool and equipment	Erection of camp structures	Assembly of camp facilities
SUBJECTS (PM)	Use of hand and power tools	Use of hand and power tools Communicating with radio telephone	Erection of camp structures	Erection of camp structures	Administration Exams
COURSE OUTLINES	B6	B6,A11	B8,D1	D1	D2
MATERIALS	Hand and power tools	Hand and power tools	Camp equipment	Camp equipment	Camp equipment
REMARKS					

SUGGESTED WEEKLY TIMETABLE FOR WEEK 3

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Erection of camp facilities Erection of camp structures	Field trip	First aid	First aid	First aid
SUBJECTS (PM)	Erection of camp structures	Field trip	First aid	First aid	First aid
COURSE OUTLINES	D1,D2		B1	B1	B1
MATERIALS	Camp equipment		First aid equipment	First aid equipment	First aid equipment
REMARKS		Visit coordination transportation Meals	Outside instructor	Outside instructor	outside instructor

SUGGESTED WEEKLY TIMETABLE FOR WEEK 4

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Working with cables chain and ropes	Site clearance and foundation construction	Support equipment	Support equipment	Support equipment
SUBJECTS (PM)	Working with cable chain and ropes	Site clearance and foundation construction	Support equipment	Support equipment	Exams
COURSE OUTLINES	B7	F1	G1	G1	G1
MATERIALS	Specified materials		Support equipment	Support equipment	support equipment
REMARKS			Outside equipment and representatives		

SUGGESTED WEEKLY TIMETABLE FOR WEEK 5

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Anchoring the drill Erection of derricks, masts baskets and slides	Erection of derricks, masts, baskets and slides Erection of floor and drill shack	Erection of floor and drill shack	Installing water line pumps and heaters	Holiday
SUBJECTS (PM)	Erection of derricks, masts baskets and slides	Erection of floor and drill shack	Erection of floor and drill shack Spare	Installing water line pumps and heaters	Holiday
COURSE OUTLINES	F2,F4	F4,F3	F3	F5	
MATERIALS				Specified equipment	
REMARKS	Drill required				

SUGGESTED WEEKLY TIMETABLE FOR WEEK 6

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Holiday	Installing water line pumps and heaters	Setting up a mud system Mud mixing	Assembly and maintenance of surface tools	Starting and stopping the drill and pump
SUBJECTS (PM)	Holiday	Installing water line pumps and heaters	Mud mixing	Checking oil and fuel systems Administration	Exams
COURSE OUTLINES		F5	F6,F7	H3,E1	
MATERIALS					
REMARKS					

SUGGESTED WEEKLY TIMETABLE FOR WEEK 7

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Field trip	Field trip	Rock characteristics and formations Assembly and maintenance of diamond tools	Overburden drilling Casing overburden	Assembly and maintenance of core barrels
SUBJECTS (PM)	Field trip	Field trip	Assembly and maintenance of diamond tools Spare	Assembly and maintenance of core barrels	Preparation and set up for fluids and lubricants
COURSE OUTLINES			A9,H2	I3,I4,H1	H1,F8
MATERIALS	Visit coordination Meals Transportation Accommodation				
REMARKS			Guest lecturer: Geologist		

SUGGESTED WEEKLY TIMETABLE FOR WEEK 8

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Starting and stopping of drill rotation and feed Start coring procedures	Starting and stopping of drill rotation and feed Start coring procedures	Retrieving core	Retrieving core	Hoisting and lowering rods Recovery of sludge samples
SUBJECTS (PM)	Starting and stopping of drill rotation and feed Start coring procedures	Starting and stopping of drill rotation and feed Start coring procedures	Retrieving core	Handling and storage of core Spare	Exams
COURSE OUTLINES	I2,I6	I2,I6	I7	I5	I8,J4
MATERIALS					
REMARKS					

SUGGESTED WEEKLY TIMETABLE FOR WEEK 9

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SUBJECTS (AM)	Cementing and capping a hole	Tear down and move/storage	Tear down and move/storage Exam Spare	Field trip	Using nets and slings with helicopters Permafrost techniques
SUBJECTS (PM)	Methods of hole survey	Tear down and move/storage	Construction and maintenance of a heliport Construction of docks and ramps for fixed wing aircraft Signals working with aircraft	Field trip	Exam Administration
COURSE OUTLINES	J2,J3	F9	F9,K1,K2,K3		K4,J1
MATERIALS					
REMARKS	Survey equipment required		Drill and equipment can be removed	Visit coordination Transportation Meals	Coordination of helicopter

Summary of Level 1 Course Outline

		No. of Periods
1-1:	Historical development of diamond drilling	2
1-2:	Career potential in the industry	2
1-3:	The requirements for personal and social development	1
1-4:	Procedures for arranging personal gear	1
1-5:	Company and employee goals	1
1-6:	The need for confidentiality	1
1-7:	Observing, assessing and suggesting job improvements	1
1-8:	Diamond drilling terminology	2
1-9:	Rock characteristics and formations	2
1-10:	Communicating in the work environment	1
1-11:	Communicating effectively using the radio telephone	3
1-12:	Description and characteristics of the diamond drill	2
2-1:	Elementary first aid	28
2-2:	Hazards, regulations and control of dangerous and flammable materials	1
	Using fire fighting equipment	2
2-3:	Environment and wildlife protection	1
2-4:	Safe work habits	2
2-5:	Selection and use of proper safety apparel	1
2-6:	Use of hand and power tools	14
2-7:	Working safely with cables, chains, ropes and sprockets	7
2-8:	The maintenance and care of tools and equipment	4
3-1:	Loading and unloading vehicles	3
3-2:	Loading and unloading aircraft, helicopters and barges	2
4-1:	The erection of camp structures	14
4-2:	The assembly and erection of camp facilities	7
5-1:	Checking oil and fuel systems	2
6-1:	Site clearance and drill foundation construction	7
6-2:	Anchoring the drill	1
6-3:	Erecting the floor and drill shack	11
6-4:	Erection of derricks, masts, baskets and slides	7

		No. of Periods
6-5:	Installing water line pumps and heaters	14
6-6:	Setting up a mud system	3
6-7:	Mud mixing	4
6-8:	Preparation and set up for fluids and lubricants	2
6-9:	Tear down and move/ storage	8
7-1:	Operation and maintenance of support equipment	18
8-1:	Assembly and maintenance of core barrels	7
8-2:	Assembly and maintenance of diamond tools	4
8-3:	Assembly and maintenance of surface tools	4
9-1:	Starting and stopping the drill and pump	4
9-2:	Starting and stopping drill rotation and feed	3
9-3:	Overburden drilling	2
9-4:	Casing the overburden	2
9-5:	Proper handling and storage of the core	1
9-6:	How to start coring procedures	11
9-7:	How to retrieve core	11
9-8:	Hoisting and lowering rods	3
10-1:	Permafrost techniques	1
10-2:	Cementing and capping a hole	4
10-3:	Methods of hole survey	3
10-4:	Recovery of sludge samples	1
11-1:	Construction and maintenance of a heliport	1
11-2:	Construction of docks and ramps for fixed wing aircraft	1
11-3:	Use of signals when working with aircraft	1
11-4:	Using nets and slings with helicopters	3
12-1:	Field trips	28
	Examinations	15
	Administration	5
	Spare	4
	Total:	301 periods (8 weeks and 3 days)

OBJECTIVE 1-1

Gain a detailed knowledge of the historical development of the diamond drilling industry and its contribution to economic development

Location
1. Classroom

Task
Comprehend the subject material in order to have a better understanding of the diamond drilling industry.

Teaching points
1. History of diamond drilling
2. Diamond drills
3. The romance of diamond drilling (anecdotes)
4. Deep drill holes
5. Ripple Rock, B. C.

Teaching method
1. Teaching

Periods allotted
2 x 50 minutes.

Remarks
Instructors should use this period to introduce themselves and their experiences in the field. This period can also be used as an introductory session for the trainees, as they may state their experiences and what they expect from diamond drilling.

Reference
1. Cumming, Diamond Drilling Handbook (chap. 1 & chap. 8).

OBJECTIVE 1-2

Gain a detailed knowledge of career potential in the diamond drilling industry.

Location
1. Classroom

Task
Comprehend the conditions of diamond drilling and the remuneration and training of diamond drillers.

Teaching points
1. Job-site conditions
2. Terms of employment
3. Unions and collective agreements
4. Salary, bonuses and expenses
5. Classification levels of diamond drillers
6. Western Diamond Drilling Contractors Association
   - Certification
   - Training programs

Teaching methods
1. Lecture
2. Discussion

Periods allotted
2 x 50 minutes.

Remarks
During this period a panel consisting of an experienced diamond driller, an employer, a union representative and a WDDCA representative should be invited to address the class. The class should have an opportunity to discuss the topics with the panel.

Checks
1. Written

OBJECTIVE 1-3

Gain a detailed knowledge of the requirements for personal and social development, the effect of time and distance on personal life and the need to maintain a good public image.

Location

1. Classroom

Task

Comprehend the subject material in order to have a better appreciation of the industry.

Teaching points

1. Specify the length of time to be away from home
2. Get affairs in order to minimize the effect of being away
   - Pay bills
   - Have mail forwarded or handled by others
   - Have maintenance and repairs completed on house, car, etc.
3. Plan home visits to gain maximum use of time
   - Family and recreation
   - Personal business
4. Be effective in off-shift time in order to encourage personal development
   - Relax with hobbies, reading, music, etc.
   - Self-development through courses (night school. correspondence)
5. Avoid the image of the high living, fast spending hard drinker (promote professionalism instead)
   - Better home image
   - Better self, company, and client image.

Teaching methods

1. Lecture
2. Discussion

Period allotted

1 x 50 minutes.

Checks

1. Assessment based upon class participation.

OBJECTIVE 1-4

Gain a detailed knowledge of the procedures for arranging personal gear.

Location
1. Classroom

Task
Show through participation in discussion that the subject material has been absorbed.

Teaching points
1. Personal gear
   - Safety equipment
   - Personal clothing
   - Accommodation items
   - Shaving or cleaning kit
   - Recreational items
2. Personal documents
   - Passport
   - Medical
   - Documentation (notification of kin, medical alert, etc.)

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes.

Remarks
The instructor should make the trainees aware that they must be well organized before going to an isolated location. Trainees must plan for their own comfort.

Checks
1. Assessment based upon class participation.

OBJECTIVE 1-5

Gain a basic knowledge of company and employee goals.

Location
1. Classroom

Task
Comprehend the general company goals and how these can be related to personal goals.

Teaching points
1. Identification of company goals
    - Company profit
    - Client satisfaction
    - Organizational strength
    - Company growth
2. Identification of personal goals
    - Good pay
    - Security
    - Advancement
3. Relating company to personal goals
    - Profit relates to wages
    - Organizational strength relates to security and advancement
    - Growth relates to security and advancement

Teaching methods
1. Lecture
2. Class discussion

Period allotted
1 x 50 minutes.

Remarks
The instructor should initially cover the teaching points with a lecture and then confirm the material through class discussion. The long and short term ramifications of failure to achieve a personal or company goal should be discussed.

Checks
1. Assessment based upon class participation.

OBJECTIVE 1-6

Gain a basic knowledge of the need for confidentiality.

Location
1. Classroom

Task
Comprehend the need for confidentiality and how it can be compromised.

Teaching points
1. Reasons for confidentiality
    - Mineral exploration
    - Site investigation
2. Breaches of confidence
    - Intentional
    - Unintentional (giving access, answering questions)

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes.

Remarks
Several examples should be presented to the class for discussion. This subject should be related back to company and employee goals.

Checks
1. Assessment based upon class participation.

OBJECTIVE 1-7

Gain a basic knowledge of the importance of observing and assessing job improvements.

Location
1. Classroom

Task
Recognize the factors which affect the overall efficiency of a job and understand how improvements are to be assessed.

Teaching points
1. How to measure production
2. How to determine the cost of operations
3. Relating cost vs. production (is an improvement apparent?)

Teaching methods
1. Lecture
2. Class problem solving

Period allotted
1 x 50 minutes.

Remarks
The trainee should be given the teaching points in a lecture and then work out a few sample problems. The problems should introduce a few variables that the trainee will assess, then determine whether or not the variations are really improvements. This subject should be taught in the latter part of the course after a better understanding of diamond drilling has developed.

Checks
1. Written

References
1. Course notes
2. Example problems

OBJECTIVE 1-8

Gain a detailed knowledge of proper diamond drilling terminology.

Locations
1. Classroom
2. Outside equipment area

Task
Become familiar with the terms found in the reference material.

Teaching points
1. Glossary of terms

Teaching methods
1. Review of reference material
2. Identification of models, equipment, photographs and diagrams.

Periods allotted
2 x 50 minutes.

Training aids
1. Reference material
2. Models
3. Photographs and slides
4. Course equipment

Checks
1. Assessment based upon class participation.

OBJECTIVE 1-9

Gain a basic knowledge of rock characteristics and formations.

Location
1. Classroom

Task
Demonstrate an understanding of:
1. The physical qualities of rock
2. The origin of rock
3. Geological structures
4. Properties of the diamond drill core

Teaching points
1. Physical qualities of rock
    - Lustre
    - Hardness
    - Fracture and cleavage
    - Colour and streak
    - Specific gravity
2. Origin of rock
    - Igneous
    - Sedimentary
    - Metamorphic
3. Geological structures
    - Folds
    - Faults
    - Intrusions
4. Properties of the diamond drill core
    - Cohesiveness
    - Grain size
    - Rock formation
    - Common rock types
    - Mineralization

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes.

Training aids
1. Reference materials
2. Mineral samples

Remarks
This subject should be taught by a qualified geologist just prior to teaching diamond bits.

Checks
1. Written

OBJECTIVE 1-10

Gain a basic knowledge of methods of communication in the work environment and the ability to receive industry-related instructions.

Location
1. Classroom

Task
Participate in class exercises and demonstrate that the subject material has been absorbed and can be applied.

Teaching points
1. Main responsibilities of supervisors
2. Ways to develop a good work relationship
3. Visual (non-verbal) communications
4. The client's representative

Teaching methods
1. Presentation of material
2. Reinforcement through scenarios and discussion (using good and bad examples)

Period allotted
1 x 50 minutes.

Training aids
1. Communication situations

Checks
1. Assessment based upon class participation.

References
1. Course notes

OBJECTIVE 1-11

Gain a detailed knowledge of the radio telephone and demonstrate a skilled ability to communicate effectively using this equipment.

Location
1. Classroom

Task
Demonstrate an ability to use radio equipment correctly.

Teaching points
1. Features, characteristics and operation of equipment
2. Establishing communication
3. Phonetic alphabet
4. Voice procedure
5. Antenna adjustments and trouble shooting

Teaching methods
1. Lecture
2. Class practice

Periods allotted
3 x 50 minutes.

Training aids
1. Radio telephone equipment

Remarks
Approximately one period should be spent in a lecture situation. The balance of time should be spent practising skill and confidence development after the trainee has had time to absorb the study material.

Checks
1. Written
2. Skill check

OBJECTIVE 1-12

Gain a detailed knowledge of the description and characteristics of the diamond drill and its components.

Location
1. Classroom

Task
Pass a written test on the characteristics and description of the diamond drill and identify the components of the drill.

Teaching points
1. Purpose of drilling units
2. Main parts of the drill
3. Functions of the four main parts

Teaching methods
1. Lecture
2. Demonstration

Periods allotted
2 x 50 minutes.

Training aids
1. Diamond drill
2. Lecture notes
3. Reference materials

Checks
1. Written
2. Oral

OBJECTIVE 2-1

Gain a detailed knowledge of elementary first aid and demonstrate a skilled ability to administer it.

Location
1. Classroom

Task
Pass a written first aid examination and demonstrate the skills and confidence to administer first aid.

Teaching points
1. Safety oriented first aid
2. Minor injuries and self-care
3. Cold and hot weather dangers and treatment
4. Basic first aid, including emphasis on:
   - Wounds and bleeding
   - Shock
   - Injuries to bones and joints
   - Injuries to head, neck and spine
   - Burns and scalds
   - Injuries to the eye
   - Handling the sick or injured

Teaching methods
1. Lecture
2. St. John's Ambulance multi-media system
3. Class participation

Periods allotted
28 x 50 minutes

Training aids
1. St. John Ambulance multi-media package
2. No. 3 first aid kits
3. Blankets
4. Splints
5. Stretchers

Remarks
The multi-media package (9 periods) should be presented early in the course in order to emphasize safety consciousness.

Checks
1. Written
2. Skill check

OBJECTIVE 2-2

Gain a detailed knowledge of the hazards, regulations and control of dangerous and flammable materials.

Locations

1. Classroom
2. Outside demonstration area

Task

Demonstrate a detailed knowledge of the hazards, regulations and controls of:

1. Gasoline and naphta
2. Diesel fuel
3. Propane
4. Oils and grease
5. Antifreeze
6. Hydrofluoric acid (4%)
7. Fire fighting equipment and methods

Teaching points

1. Identification of hazardous materials and their characteristics
2. Labeling, storage location and container requirements
3. Safe working procedures
4. Identification, use and capacity of fire fighting equipment

Teaching methods

1. Lecture
2. Demonstration
3. Class participation

Period allotted

1 x 50 minutes

Training aids

1. Specified hazardous materials
2. Suitable and unsuitable container examples
3. Fire demonstration containers
4. Fire extinguishers
5. WCB films

Remarks

The instructor should allow the trainee to identify the specified materials and witness the effects. A short scenario demonstrating incorrect procedures and containers would generate interest.

Checks

1. Written

References
1. Course notes
2. WCB Industrial Health and Safety Regulations (sec. 12)
3. Safety Manual for Diamond Drillers (CDDA) (chap. 8 & chap. 13)

OBJECTIVE 2-2a

Demonstrate a skilled ability to use fire fighting equipment.

Location
1. Work area

Task
Demonstrate an ability to select and operate fire fighting equipment and extinguish a fire.

Teaching points
1. Selecting the correct equipment
2. Techniques to extinguish a fire

Teaching methods
1. Demonstration
2. Class participation

Periods allotted
2 x 50 minutes

Training aids
1. Selected flammable materials
2. Fire fighting equipment
3. Open container for fire
4. A fire to be extinguished
5. Protective clothing

Remarks
Emphasis should be on class participation so that the trainee will understand and feel confident using fire fighting equipment. Each trainee should extinguish a fire.

Checks
1. Skill check

References
1. Manufacturer's user handbooks

OBJECTIVE 2-3

Gain a basic knowledge of the principles of environment and wildlife protection.

Location
1. Classroom

Task
Comprehend the subject in order to practice good habits in the field.

Teaching points
1. Terms and definitions
2. Reasons for maintaining clean work areas
3. Sources of pollution
4. Methods of controlling pollution
5. Wildlife control and protection

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes

Remarks
If possible this lecture should include a representative from the Fisheries and Wildlife branch.

Checks
1. Written

OBJECTIVE 2-4

Cultivate safe work habits.

Locations
1. Classroom
2. Work environment

Task
Comprehend the subject and demonstrate an ability to translate this knowledge into safe work habits.

Teaching points
1. Definition of an accident
2. Causes of accidents
    - Act
    - Condition
3. The diamond drillers five point safety system
4. Advantages of using ice for travel and drilling
5. Safety measures when travelling over ice
6. Advantages and safety measures of using waterways
7. Control of the blasting area
8. During firing explosives:
    - Prohibition of vehicles
    - Blaster's responsibility
    - Signals
9. Reasons for the use of helicopters and fixed wing aircraft
10. Helicopter safety rules
11. Firearms control
12. Reporting and correcting unsafe conditions

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Remarks
The purpose of this lecture is to ensure that the trainee understands the principles of safety. This knowledge should be demonstrated through proper work habits during the remainder of the course.

Checks
1. Written
2. Assessment (The contents of this subject are to be taught and tested at the beginning of the course. However, half of the credit is to be based upon the trainee's adherence to safety rules during the course.)

References
1. Safety Manual for Diamond Drillers (CDDA)

OBJECTIVE 2-5

Gain a detailed knowledge of the use of proper safety apparel and demonstrate a skilled ability to select and wear it.

Locations
1. Classroom
2. Work environment

Task
Comprehend the need for safety apparel and demonstrate an ability to select the proper apparel for the job.

Teaching points
1. Selection and wearing of personal work clothing
2. Identification, selection and wearing of safety apparel including:
    - Hard hat
    - Ear protectors
    - Eye shields
    - Aprons
    - Hard toe boots
    - Gloves (including electrical and chemical protection)
    - Chain saw protection
    - Safety belt

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Period allotted
1 x 50 minutes

Training aids
1. Specified safety apparel

Remarks
The purpose of this lecture is to ensure that the trainee understands the use of safety apparel. This knowledge should be demonstrated through proper work habits during the remainder of the course.

Checks
1. Written
2. Assessment based upon class participation

(The contents of this subject are to be taught and tested at the beginning of the course. However, half of the credit is to be based upon the trainee's adherence to safety rules during the course.)

References
1. Safety Manual for Diamond Drillers (CDDA) (chap. 4)
2. WCB Industrial Health and Safety Regulations (sec. 14)

OBJECTIVE 2-6

Gain a detailed knowledge of industry-related hand and power tools and demonstrate a skilled ability to use them.

Locations
1. Classroom
2. Work area

Task
Demonstrate a thorough ability to correctly select and use:
1. Degree rules
2. Axes and saws
3. Shovels, picks, mattocks and grub hoes
4. Hammers and bars
5. Grease guns
6. Foot clamps, pipe wenches, lowering iron and hoisting equipment
7. Chain saws
8. Plugger
9. Electric drill
10. Skill saw

Teaching points
Detailed on supplementary sheets (see 2-6a, 2-6b, and 2-6c).

Periods allotted
Detailed on supplementary sheets.

Training aids
Detailed on supplementary sheets (in all cases appropriate safety apparel is required).

Remarks
Safety measures for each tool must be stressed.

Checks
1. Written
2. Skill check

References
1. Manufacturers' literature
2. Course reference material

SUPPLEMENTARY SHEET 2-6a

Subject
1. Axes
2. Saws

Teaching points
1. Types of axes and saws
2. Safety features
3. Fitting handle
4. Practice with axes and saws

Periods allotted
2 x 50 minutes

Training aids
1. Axes and saws sufficient for demonstration and class practice
2. Waste timber

Remarks
The fundamentals should be taught in a lecture and demonstration followed by skill practice.

Subject
1. Shovels
2. Picks
3. Mattocks
4. Grab hoes

Teaching points
1. Types of shovels
2. Types of picks and grub hoes
3. Application of shovels, picks and grub hoes

Periods allotted
2 x 50 minutes

Training aids
Tools sufficient for demonstration and class practice

Remarks
The fundamentals should be taught in a lecture and demonstration followed by skill practice.

Subject
1. Hammers
2. Bars

Teaching points
1. Types of hammers and uses
2. Types of bars and uses
3. Safety practices when using hammers and bars

Period allotted
1 x 50 minutes

Training aids
Tools sufficient for demonstration and class practice

Remarks
The fundamentals should be taught in a lecture and demonstration followed by skill practice.

SUPPLEMENTARY SHEET 2-6b

Subject

1. Grease guns
2. Fuel pumps

Teaching points

1. Types and uses of grease guns
2. Reasons for lubrication
3. Effects of inadequate lubrication
4. Procedures for filling grease guns
5. Characteristics and servicing of fuel pumps

Period allotted

1 x 50 minutes

Training aids

1. Grease guns
2. Grease fittings
3. All-purpose grease (in container)
4. Grease cartridges
5. Equipment to be greased
6. Fuel pumps

Subject

1. Chain saws

Teaching points

1. General description and features
2. Starting the saw
3. Preventive maintenance
4. Cold weather operation
5. Engine adjustments
6. Filing
7. Trouble shooting

Periods allotted

4 x 50 minutes

Training aids

1. Chain saws
2. Maintenance equipment
3. Work material

Remarks

This subject should be taught in conjunction with the chain saw in order to encompass common procedures such as adjustments and trouble shooting.

SUPPLEMENTARY SHEET 2-6c

Subject

1. Pluggers

Teaching points

1. General description and features
2. Starting
3. Preventive maintenance
4. Optional equipment
5. Trouble shooting

Periods allotted

2 x 50 minutes

Training aids

1. Pluggers
2. Maintenance tools

Remarks

This subject should be taught in conjunction with the chain saw in order to encompass common items such as adjustments and trouble shooting.

Subject

1. Electric drill
2. Skill saw

Teaching points

1. Drills:
   - Characteristics and limitations of the data plate and chuck
   - Centre punching
   - Pilot holes
   - Drilling (maintain speed, steady pressure and alignment)
2. Saws:
   - Characteristics and limitations of the data plate
   - Safety features
   - Use of different blades
   - Cuts (depths, cross-cut, rib, bevel and pocket)
   - Maintenance

Periods allotted

2 x 50 minutes

Training aids

1. Drills and saws
2. Maintenance and adjustment tools
3. An assortment of drill blades and accessories
4. Waste material for drilling and cutting

OBJECTIVE 2-7

Gain a detailed knowledge of working safely with cables, chains and rope and demonstrate a skilled ability to use them.

Locations
1. Classroom
2. Outside work area

Task
Demonstrate an ability to use the specified equipment effectively and safely.

Teaching points
1. Types, description, care and treatment of rope
2. Knots and lashings
    - Whipping
    - Reef knot
    - Sheet bend (single and double)
    - Bowline
    - Timber hitch
    - Catspaw
    - Blackwall hitch (single and double)
3. Types, description, care and treatment of cable
4. Cable fastenings
    - Improvised knots
    - Bulldog clamps
    - Nico clamps
5. Mechanical aids to manpower
    - Rollers
    - Parbuckling
    - Blocks and tackles
    - Come-along
    - Jacks

Teaching methods
1. Lecture
2. Demonstration
3. Class participation
4. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Equipment
2. Subject material sufficient to allow class participation

Checks
1. Written
2. Skill check

References
1. Course notes

OBJECTIVE 2-8

Gain a detailed knowledge of caring for tools and equipment and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a detailed knowledge of the subject and demonstrate a skilled ability to maintain tools and equipment.

Teaching points
1. Proper storage of tools and equipment
2. Inspection of tools and equipment
3. Sharpening of tools and equipment

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. All the tools and equipment covered in the "tools and equipment" objectives of this course.
2. Maintenance tools and equipment.

Remarks
This subject is to be conducted concurrently with hand and power tools.

Checks
1. Written
2. Skill check

OBJECTIVE 3-1

Gain a basic knowledge of the principles of loading and unloading vehicles and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Participate in loading and unloading of vehicles under supervision.

Teaching points
1. Classification of vehicles
2. Packing and crating of goods
3. Weight distribution
4. Sequence of loading and unloading
5. Tying down
6. Protection from the elements
7. Height, weight and width restrictions

Teaching methods
1. Lecture
2. Class participation

Periods allotted
3 x 50 minutes

Training aids
1. Vehicles
2. Loads

Remarks
Half of the time should be used to confirm the trainee's knowledge by using a skill check-list. This objective may be applied at the beginning or end of the course to ship or receive course materials.

Checks
1. Skill check

OBJECTIVE 3-2

Gain a detailed knowledge of the principles of loading and unloading aircraft, helicopters and barges and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Pass a written general knowledge test and demonstrate the skills required to load aircraft, helicopters and barges.

Teaching points
1. Weight distribution
2. Sequence of loading and unloading
3. Tying down

Teaching methods
1. Lecture
2. Class participation

Periods allotted
2 x 50 minutes

Training aids
1. Real or simulated barges, aircraft or helicopters
2. Loads

Checks
1. Written
2. Skill check

OBJECTIVE 4-1

Gain a basic knowledge of the erection of camp structures and demonstrate a skilled ability to perform the procedures.

Location

1. Work area

Task

Demonstrate sufficient knowledge and skills to participate effectively in the field erection of camp structures.

Teaching points

1. Housing tents
   - Foundation
   - Joists
   - Floor
   - Wall systems
   - Roof systems and fly
   - Stove
   - Beds
2. Dry tents
   - Water storage tank
   - Hot water tank
   - Water connection
   - Water pump system
   - Wash basins/ troughs
   - Shower
   - Washing machine
   - Clothes drying racks/ lines
   - Drain lines
3. Kitchen tent
   - Cook stove
   - Cooking grill
   - Sink and cabinet assembly
   - Fridge
   - Freezer
   - Table and benches

Teaching methods

1. Lecture
2. Demonstration
3. Class participation

Periods allotted

14 x 50 minutes

Training aids

1. Camp structures equipment and material as specified by the above list.

Checks

1. Written
2. Skill check

OBJECTIVE 4-2

Demonstrate a limited ability to assemble and erect camp facilities.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to assist in the field assembly of camp facilities.

Teaching points
1. Outhouses
    - Layout and design
    - Construction
2. Water supply
    - Gravity system
    - Pump system
3. Power
    - Generator
    - Distribution
4. Waste water
    - Piping
    - Soakage pit
5. Fire points

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Camp facility components as specified by the above list.

Remarks
This objective may be combined with OBJECTIVE 2-6 (Power and hand tools) to provide practical projects.

Checks
1. Skill check

OBJECTIVE 5-1

Gain a basic knowledge of the procedures for checking oil and fuel systems and demonstrate a skilled ability to perform these procedures.

Location
1. Classroom

Task
Comprehend the reasons for the check out and the points to be checked.

Teaching points
1. Reasons and importance of checking fuel and oil systems
2. Components to be checked
3. Fuel and oil lines
4. Connections and gaskets
5. Tanks and reservoirs
6. Fuel and oil purity
7. Air and oil filters
8. Instrumentation

Teaching methods
1. Lecture
2. Demonstration
3. Individual skill development

Periods allotted
2 x 50 minutes

Training aids
1. Equipment

Checks
1. Written
2. Skill check

OBJECTIVE 6-1

Gain a basic knowledge of site clearance and drill foundation construction and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate sufficient skill and knowledge to successfully participate as a member of a work team.

Teaching points
1. Term and definition
2. Parts of a drill set-up
3. Reasons for building solid level foundations
4. Materials and tools required
5. Types of overburden
6. Constructing foundations
   - Bare ground
   - Wooden skills
   - Cement
   - Logs
   - Cribbing

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
7 x 50 minutes

Training aids
1. Construction tools
2. Timber
3. Cement and gravel
4. Logs

Remarks
This objective may be taught at the same time as OBJECTIVE 2-6 (Power and hand tools) to provide practical projects.

Checks
1. Written
2. Skill check

OBJECTIVE 6-2

Gain a basic knowledge of the requirements for anchoring the drill and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Pass a basic written test and demonstrate a familiarity with the components of anchors and an ability to work with them under supervision.

Teaching points
1. Definition
2. Purpose of anchoring drill units
3. Different types of anchors
4. Anchoring drill for different applications

Teaching methods
1. Lecture
2. Demonstration

Period allotted
1 x 50 minutes

Training aids
1. Various anchors

Checks
1. Written
2. Skill check

OBJECTIVE 6-3

Gain a detailed knowledge of the erection of the floor and drill shack and demonstrate a skilled ability to perform the procedures.

Locations

1. Classroom
2. Work area

Task

Demonstrate sufficient familiarity with the components and procedures necessary to erect the floor and drill shack to fully participate under minimal supervision.

Teaching points

1. Drill floors
   - Necessity for solid decks
   - Material and tools
   - Procedure
2. Drill shacks
   - Definition and purpose
   - Types
   - Materials
   - Building procedures
   - Safety features
   - Lighting

Teaching methods

1. Lecture
2. Demonstration
3. Class practice

Periods allotted

11 x 50 minutes

Remarks

Emphasis should be on the helper's duties.

Checks

1. Written
2. Skill check

OBJECTIVE 6-4

Gain a basic knowledge of the use and erection of derricks, masts, baskets and slides and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Pass a written general knowledge test on the subject and participate satisfactorily as part of a team.

Teaching points
1. Definitions
2. Purposes of tripods, derricks and masts
3. Assembly of derricks and masts
4. Raising derricks
5. Placing baskets
6. Raising masts
7. Guy wires
8. Use of degree rule
9. Sheave wheels

Teaching methods
1. Lecture
2. Demonstration
3. Class practice (for skill assessment)

Periods allotted
7 x 50 minutes

Training aids
1. Anchored drill unit
2. Turnbuckles
3. Assorted mechanic tools
4. Sheave wheel
5. Squaw poles (2)
6. Crow bars
7. Pipe wrenches 18" (2)
8. Sledge hammer
9. Planks 2" x 8"
10. Hammer (claw)
11. Hammer (ball peen)
12. Nails 4"
13. Rope
14. Ladder
15. Derrick sections

Remarks
Maximum time should be used to erect the equipment.

Checks
1. Written
2. Skill check

OBJECTIVE 6-5

Gain a basic knowledge of locating and installing water line pumps and heaters and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the components and layout of the system and demonstrate the skills necessary for installation.

Teaching points
1. Layout of a water system
2. Terms and definitions
3. Set up and operate pumps
4. Piping connections
5. Setting up heaters
6. Suction strainers and foot valves

Teaching methods
1. Lecture
2. Demonstration
3. Practice

Periods allotted
14 x 50 minutes

Training aids
1. Pumps and heaters
2. Installation tools

Remarks
It is suggested that half the alloted time be used to practice and confirm individual skills in pump trouble-shooting.

Checks
1. Written
2. Skill check

OBJECTIVE 6-6

Gain a basic knowledge of setting up a mud system and demonstrate a semi-skilled ability to peform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the uses of mud in diamond drilling and demonstrate an ability to set up a mud system without supervision.

Teaching points
1. Terms and definitions
2. Reasons for using mud
3. Equipment required to test mud consistency
4. Materials and equipment
5. Equipment layout
6. Mixing and testing procedures
7. Stuffing box

Periods allotted
3 x 50 minutes

Training aids
1. Mud balance
2. Marsh funnel and cup
3. Rheometer
4. PH paper
5. Filter press
6. Mud tank
7. Bentonite
8. Mud mixer

Remarks
Approximately one period should be spent on lecture and demonstration with the balance of time devoted to skill development and confirmation.

Checks
1. Written
2. Skill check

References
1. Course notes
2. Driller Handbook (chap. 10)

OBJECTIVE 6-7

Gain a detailed knowledge of mud mixing and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate the knowledge and skills necessary to carry out mud mixing procedures in the field without supervision.

Teaching points
1. Terms and definitions
2. Types and construction of mud mixers
3. Operating procedures

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
4 x 50 minutes

Training aids
1. Mud tanks
2. Mud mixers
3. Pump
4. Bentonite, carboxel, etc.
5. Marsh funnel and measuring cup
6. Flat shovel

Checks
1. Written
2. Skill check

OBJECTIVE 6-8

Gain a basic knowledge of the requirements, preparation and set up for fluids and lubricants.

Location
1. Work area

Task
Comprehend why and how fluids and lubricants are applied.

Taching points
1. Reasons for lubrication
2. Types of lubricants
3. Parts which require lubricants
4. Lubrication requirements
5. Lubrication procedures

Periods allotted
2 x 50 minutes

Training aids
1. Drill rods
2. Rod grease
3. Linseed soap
4. Soluble oils
5. Dispensers
6. Graphite grease

Checks
1. Written

OBJECTIVE 6-9

Gain a basic knowledge of tear down, moving and storage (including pulling casing) and planning moves. Demonstrate a semi-skilled ability to perform the procedures for tear down.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to perform the helper's tasks in tear down, without supervision.

Teaching points
1. Pulling casing
2. Safety procedures for dismantling masts
3. Dismantling and storing drill sheds
4. Removal of support equipment
5. Safety procedures for lowering derricks
6. Servicing and storing drilling equipment
   - Terms and definitions
   - Consequences if equipment is not serviced and stored properly
   - Special servicing requirements of drilling equipment when storing

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Training aids
1. Drill
2. Hole with casing in place

Checks
1. Written
2. Skill check

OBJECTIVE 7-1

Gain a basic knowledge of the operation and maintenance of support equipment and demonstrate a semi-skilled ability to maintain and operate fixed equipment and a limited skilled ability to maintain and operate mobile equipment.

Location
1. Classroom

Task
Pass a written examination and demonstrate either a semi-skilled or limited skill ability to maintain and operate equipment (as specified on the list below):
1. Fixed equipment (semi-skill)
    - Gas and diesel engines
    - Propane equipment
    - Compressors
    - Fuel storage containers
    - Generators
2. Mobile equipment (limited skill)
    - Water trucks
    - Motor boats
    - Cats and skidders
    - Muskegs and skidoos
    - Trucks

Teaching points
1. As detailed on supplementary sheets (see 7-1a, 7-1b, and 7-1c).

Periods allotted
As detailed on supplementary sheets.

Training aids
1. As detailed on supplementary sheets

Remarks
Safety measures for each piece of equipment must be stressed.

Checks
1. Written
2. Skill assessment

References
1. Course notes
2. Manufacturers' literature

SUPPLEMENTARY SHEET 7-1a

Subject

1. Gas engines and diesel engines

Teaching points

1. Terms and definitions
2. Inspection
   - Fuel lines
   - Electrical
   - Cooling system
   - Exhaust system
3. Starting and operating
4. Engine indicators (gauges)
5. Maintenance

Periods allotted

3 x 50 minutes

Training aids

1. Engines
2. Servicing tools

Subject

1. Propane equipment

Teaching points

1. Components
2. Uses and advantages of propane
3. Transporting, installing and storing propane
4. Effects of temperature and pressure

Period allotted

1 x 50 minutes

Training aids

1. Propane equipment

Subject

1. Compressors and generators

Teaching points

1. Characteristics and uses
2. Starting and operating
3. Maintenance

Periods allotted

2 x 50 minutes.

Training aids

1. Compressor
2. Tools

Remarks

This subject should deal mainly with the compressor and tools. The engine should be dealt with under gas and diesel engines.

SUPPLEMENTARY SHEET 7-1b

Subject
1. Fuel storage containers

Teaching points
1. Locating and installing
2. Safety
3. Inspection
4. Using

Period allotted
1 x 50 minutes

Training aids
1. Fuel storage containers

Subject
1. Trucks

Teaching points
1. Description and characteristics
2. Operating
3. Inspection and maintenance

Periods allotted
4 x 50 minutes

Training aids
1. Vehicles

Remarks
Emphasis should be placed on operating vehicles on the type of terrain likely to be found on a diamond drilling site. Safety, handling and four-wheel drive should also be emphasized.

Subject
1. Water trucks

Teaching points
1. Characteristics and uses
2. Operation
3. Servicing

Period allotted
1 x 50 minutes

Training aids
1. Water truck

SUPPLEMENTARY SHEET 7-1c

Subject

1. Motor boats

Teaching points

1. Characteristics and uses
2. Starting and operating
3. Maintenance

Period allotted

1 x 50 minutes

Remarks

This subject should be covered in a single lecture unless a boat is available.

Subject

1. Cats
2. Skidders

Teaching points

1. Characteristics and uses
2. Starting and operating
3. Maintenance

Periods allotted

3 x 50 minutes

Remarks

Emphasis on this subject should be placed on maintenance.

Subject

1. Muskegs
2. Skidoos

Teaching points

1. Characteristics and uses
2. Cold weather and safety
3. Starting and operating
4. Maintenance

Periods allotted

2 x 50 minutes

OBJECTIVE 8-1

Gain a basic knowledge of the assembly and maintenance of core barrels, and demonstrate a semi-skilled ability to perform these procedures.

Locations
1. Classroom
2. Work area

Task
Gain a knowledge of the subject and demonstrate the skills required to assemble and maintain down hole tools.

Teaching points
1. Types and description of core barrels
2. Core tube
3. Overshot
4. Drill rods

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Core barrels

Checks
1. Written
2. Skill check

OBJECTIVE 8-2

Gain a basic knowledge of the assembly and maintenance of diamond tools and demonstrate a semi-skilled ability to perform these procedures.

Locations
1. Classroom
2. Work area

Task
Gain a knowledge of the subject and demonstrate the skills required to assemble and maintain diamond tools.

Teaching points
1. Terms and definitions (bits)
2. Evaluating used diamond bits
3. Terms and definitions (reaming shells)
4. Maintenance and assembly
5. Description and uses of bit and shell gauges

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Diamond tools

Checks
1. Written
2. Skill check

References
1. Diamond Drill Handbook (chap. 7)

OBJECTIVE 8-3

Gain a basic knowledge of the assembly and maintenance of surface tools and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a knowledge of the subject and demonstrate the skills required to perform assembly and maintenance of surface tools.

Teaching points
1. Types, sizes and uses of foot clamps
2. Assembling and using foot clamps safely
3. Types sizes and uses of pipe wrenches
4. Adjusting and using pipe wrenches
5. Description and uses of inner tube wrenches
6. Definition of lowering irons
7. Advantages and disadvantages of lowering irons
8. Assembling and using lowering irons
9. Other types of hoising equipment
10. Hoisting plugs
11. Water swivels
12. Holding dogs
13. Stuffing boxes
14. Ball-type pulling dog
15. Knife dogs
16. Brown tongs
17. Come-a-longs

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Foot clamps
2. Pipe wrenches
3. Lowering irons
4. Inner tube wrenches

Checks
1. Written
2. Skill check

OBJECTIVE 9-1

Gain a detailed knowledge of starting and stopping the drill and pump engines and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate the skills required to start and operate the drill and pump under minimal guidance.

Teaching points
1. Terms and definitions
2. Starting and operating
3. Types and reasons for starting aids
4. Drill engine indicators
5. Safety measures when starting pump motors

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
4 x 50 minutes

Training aids
1. Diamond drill rig

Remarks
The allotted periods may be combined with other procedures to teach and practice several skills at once.

Checks
1. Skill check

OBJECTIVE 9-2

Gain a basic knowledge of the procedures for starting and stopping the drill rotation and feed, and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate the skills required to start pumping, rotation and feed with minimum guidance.

Teaching points
1. Terms and definitions
2. Engaging clutch
3. Transmissions
4. Controls for hoisting and drilling
5. Penetration rate and how it is achieved

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
3 x 50 minutes

Training aids
1. Diamond drill

Remarks
The allotted periods may be combined with other procedures to teach and practice several skills.

Checks
1. Skill check

OBJECTIVE 9-3

Gain a basic knowledge of overburden drilling.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to participate in overburden drilling operations.

Teaching points
1. Terms and definitions
2. Methods used to penetrate overburden
3. Sealing casing in bedrock
4. Alignment and degree rules

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Training aids
1. Illustrations

Checks
1. Written

OBJECTIVE 9-4

Gain a basic knowledge of casing the overburden.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to participate in casing operations.

Teaching points
1. Terms and definitions
2. Purposes for installing casing
3. Techniques for installing casing
4. Casing shoes, casing bits and casing shoe bits

Teaching methods
1. Lecture and demonstration
2. Demonstration

Periods allotted
2 x 50 minutes

Training aids
1. Casings (various)
2. Casing shoes
3. Casing bits
4. Casing shoe bits
5. Tricone bit
6. Slip-rope drum
7. Drive hammers
8. Drive collars
9. Drive pipe
10. Drive shoes
11. Explosives

Remarks
This objective is an introduction to casing procedures. If time permits, actual casing operations should be carried out as part of overall drilling practices.

Checks
1. Written

OBJECTIVE 9-5

Gain a detailed knowledge of the proper handling and storage of the core and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Comprehend the subject and demonstrate an ability to handle and store core samples.

Teaching points
1. Terms and definitions
2. Different types of trays and boxes
3. Marking core trays (boxes)
4. Means and tools used to remove core
5. Keeping core clean
6. Placing core into trays
7. Contamination by oil or grease

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
1 x 50 minutes

Training aids
1. Core trays
2. Core boxes

Checks
1. Written
2. Skill check

OBJECTIVE 9-6

Gain a basic knowledge of starting coring and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Work area

Task
Comprehend the procedures leading to core recovery and demonstrate an ability to participate effectively in the field under supervision.

Teaching points
1. Lowering core barrel and rods into the hole
2. Closing swivel head
3. Lowering inner tube
4. Connecting water swivel
5. Tightening chuck
6. Drilling until blocking
7. Grinding core
8. Burning bits
9. Keeping track of rods in the hole

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
11 x 50 minutes

Training aids
1. Diamond drill

Remarks
It may be desirable to combine these periods with other practical work sessions.

Checks
1. Written
2. Skill check

OBJECTIVE 9-7

Gain a detailed knowledge of retrieving the core and demonstrate a skilled ability to perform the procedures.

Location
1. Work area

Task
Gain a knowledge of the subject and demonstrate an ability to perform the skills necessary to retrieve core.

Teaching points
1. Purpose of retrieving core barrels
2. Hoisting rods out of holes using standard core barrels
3. Equipment used for hoisting operations
4. Teamwork and safe effective hoisting performance
5. Breaking rods at right joints
6. Removing bits, shells and inner tubes
7. The wireline procedure (advantages, description and procedure)

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
11 x 50 minutes

Training aids
1. Diamond drill
2. Core barrels

Remarks
The emphasis should be on developing teamwork, confidence and reflex actions.

Checks
1. Written
2. Skill check

OBJECTIVE 9-8

Gain a detailed knowledge of hoisting and lowering rods and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Gain enough knowledge and skill to develop a higher skill level in the field.

Teaching points
1. Types of equipment used in lowering procedures
2. Steps for lowering rods into the hole
3. Precautionary measures when lowering rods
4. Possible problems
5. Remedies to overcome problems
6. Reasons for not letting the bit touch bottom
7. Measures to insure the bit will not touch bottom
8. Rod mat
9. Stacking rods

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill rig

Remarks
The practice portion of this objective is intended only to acquaint the trainee with the skills necessary and provide the confidence to further develop these skills in the field.

Checks
1. Written

OBJECTIVE 10-1

Gain a basic knowledge of permafrost techniques.

Location
1. Classroom

Task
Gain enough knowledge of permafrost techniques to participate in permafrost drilling.

Teaching points
1. Techniques used for drilling through permafrost
2. Construction and uses of settling tanks
3. Recovering frozen rods and casings
4. Caring for equipment when using calcium chloride

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 10-2

Gain a basic knowledge of cementing and capping a hole, and demonstrate a limited ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain the necessary knowledge to cement and cap a hole.

Teaching points
1. Types of cement
2. Reasons for cementing a drill hole
3. Mixing and placing procedures

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
4 x 50 minutes

Training aids
1. Drill
2. Quick set cement
3. Open end drum
4. Hoisting clamp
5. Pipe wrenches
6. Shovel and wooden pallet

Remarks
Cementing should be presented as an exercise in which the students participate to learn the procedure and skills but are not assessed.

Checks
1. Written

OBJECTIVE 10-3

Gain a basic knowledge of the methods of conducting hole survey and demonstrate a limited ability to perform the procedures.

Location
1. Classroom
2. Work area

Task
Demonstrate an ability to work with the equipment in order to carry out survey operations in the field.

Teaching points
1. Definition
2. Testing equipment
3. Information from surveying the drill hole
4. Wedging to correct hole alignment

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Culture tube
2. 4% acid
3. Clinometer
4. Liquid gelatin
5. Compass
6. Non-magnetic rod
7. Compass with clockwork mechanism

Remarks
The trainees should handle the equipment and be familiar with the operation.

Checks
1. Written

OBJECTIVE 10-4

Gain a basic knowledge of the methods used to recover sludge samples.

Location
1. Classroom

Task
Gain the knowledge necessary to participate in sludge collection procedures in the field.

Teaching points
1. Reasons for sludge collection
2. Methods of sludge collection
    - Tub
    - Sludge box
    - Thompson sludge cutter
3. Permanent filing cf samples

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Training aids
1. Photographs
2. Slides

Checks
1. Written

Reference
1. Diamond Drill Handbook (chap. 12)

OBJECTIVE 11-1

Gain a limited knowledge of the construction and maintenance of a heliport and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to participate in the construction of a heliport and comprehend the maintenance requirements.

Teaching points
1. Description and characteristics of helicopters
2. Approach and departure requirements
3. Pad requirements
4. Maintenance requirements

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Training aids
1. Photographs
2. Slides

Remarks
The skill assessment portion of this objective must be done in conjunction with the objectives covering hand and power tools. The instructor must ensure that while working with hand and power tools any special techniques pertaining to heliport construction are covered.

Checks
1. Written
2. Skill check

OBJECTIVE 11-2

Gain a basic knowledge of the construction of docks and ramps for fixed wing aircraft and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to participate in the construction of docks and ramps.

Teaching points
1. Description and characteristics of aircraft
2. Docking and ramp requirements
3. Construction details

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Training aids
1. Photographs
2. Slides

Remarks
The skill assessment portion of this objective must be done in conjunction with objectives covering hand and power tools. The instructor must ensure that while working with hand and power tools any special techniques pertaining to this subject are covered.

Checks
1. Written
2. Skill check

OBJECTIVE 11-3

Gain a detailed knowledge of signals and demonstrate a skilled ability to use them.

Location
1. Classroom

Task
Demonstrate the skills necessary to guide aircraft using hand signals.

Teaching points
1. Information required by pilot
2. Where to stand
3. Signals

Teaching methods
1. Lecture
2. Class practice

Period allotted
1 x 50 minutes

Checks
1. Skill check

OBJECTIVE 11-4

Gain a detailed knowledge of helicopter nets and slings and demonstrate a skilled ability to use them safely.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to work confidently with helicopter nets and slings.

Teaching points
1. Description of nets and slings
2. Hooking up
3. Safety

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Nets and slings
2. Loads
3. Helicopter

Remarks
This objective is to be taught in conjunction with the objectives covering hooking up loads and safety.

Checks
1. Skill assessment

OBJECTIVE 12-1

Field Trips

During the course at least one field trip should be conducted in order to broaden the trainee's knowledge and understanding of the industry. If possible, this trip should include a visit to a working drill where the trainee will observe the pace of the work and recognize the importance of developing instinctive skills and team work.

Suggested visits are:

1. A working drill site
2. A drilling company shop or yard
3. A diamond bit manufacturer
4. A helicopter company

LEVEL 2 COURSE OUTLINE

Summary of Level 2 Course Outline

		No. of Periods
1-1:	Company and employee goals	2
1-2:	Observing, assessing and suggesting job improvements	4
1-3:	Rock characteristics and formations	1
1-4:	Communicating in the work environment	3
1-5:	Participating in a meeting	1
1-6:	Completion of progress forms	2
1-7:	Completing accident reports	1
2-1:	Safe work habits	1
3-1:	Mobilization and demobilization instructions	3
3-2:	Loading and unloading vehicles	2
3-3:	Inventory, storing, checking and reordering equipment	3
4-1:	Location, layout and preparation of a campsite	2
4-2:	Erection of camp structures	2
4-3:	Erection of camp facilities	2
4-4:	Setting up radio equipment	4
4-5:	Winterizing the camp and equipment	2
4-6:	Dismantling and cleanup of camp and camp equipment	1
5-1:	Selecting, locating and preparing routes to camps and drill sites	4
5-2:	Moving drills from off-load site to the drill site	1
5-3:	Locating and installing the water system	7
5-4:	Checking out oil, fuel, water and hydraulic systems	2
6-1:	Locating the drill hole and interpreting stake markings	3
6-2:	Site clearance and foundation construction	5
6-3:	Positioning the drill on the foundation	5
6-4:	Locating and installing water line pumps and heaters	7
6-5:	Setting up a mud system	7
6-6:	Erection of the floor and drill shack	7
6-7:	Use and erection of derricks, masts and baskets	7
6-8:	Tear-down and move/ storage operations	7
7-1:	Operation and maintenance of support equipment	9
7-2:	Maintenance and operation of camp water system	1

		No. of Periods
8-1:	Diamond bit selection and running parameters	3
8-2:	Assembly and maintenance of down hole tools	3
8-3:	Assembly and maintenance of surface tools	3
8-4:	Assembly and maintenance of diamond tools	2
9-1:	Operation of the drill	7
9-2:	Overburden drilling	7
9-3:	Casing the overburden	7
9-4:	Coring procedures	14
9-5:	Orders regarding stopping holes	1
10-1:	Requirements, preparation and set-up for fluids and lubricants	1
10-2:	Use of mud	3
10-3:	Use of water and rod greases	3
10-4:	Use of air and foam	1
11-1:	How to cement, grout and cap a hole	3
11-2:	Reaming techniques	7
11-3:	Fishing techniques	3
11-4:	Drilling with lost circulation	1
11-5:	Drilling through faults	1
11-6:	Methods of hole survey	3
11-7:	Setting wedges	7
11-8:	Application of control drilling	1
11-9:	Setting and maintaining blow-out preventers	1
11-10:	Drilling using reverse circulation	1
11-11:	Recovering sludge samples	2
11-12:	Taking soil samples	1
11-13:	Casing recovery	3
11-14:	Triple tube coring	1
12-1:	Construction and maintenance of a heliport	4
12-2:	Construction of docks and ramps for fixed wing aircraft	2
13-1:	Knowledge of hydraulic systems	3
13-2:	Elementary diesel engine repairs	3

		No. of Periods
13-3:	Cutting and welding	3
13-4:	Electrical fault finding	3
	Examinations	15
	Administration	4
	Spare	4
	Total:	239 periods (6 weeks and 4 days)

OBJECTIVE 1-1

Gain a detailed knowledge of company and employee goals.

Location
1. Classroom

Task
Gain a detailed knowledge of the company goals and how these can be related to personal goals.

Teaching points
1. Review of:
   - Identification of company goals
   - Identification of personal goals
   - Relating personal and company goals
2. Class analysis of a job

Teaching methods
1. Lecture
2. Class project or discussion

Periods allotted
2 x 50 minutes

Remarks
A simple job should be used as a working example to show how a job is bid and the award is made. Various factors should be introduced to show how the actions of the driller can have positive and negative effects.

Checks
1. Oral
2. Assessment based on class participation

OBJECTIVE 1-2

Gain a detailed knowledge of the importance and methods of observing, assessing and suggesting job improvements.

Location

1. Classroom

Task

Recognize the factors which affect the overall efficiency of a job and understand how improvements can be made.

Teaching points

1. Analysis of effectiveness and efficiency
    - Effectiveness
    - Efficiency
    - Analysis of effectiveness
    - Analysis of efficiency
2. Criteria for job improvements
3. Factors that could lead to improvements
4. Channels for processing new ideas

Teaching methods

1. Lecture
2. Discussion

Periods allotted

4 x 50 minutes

Remarks

The teaching points should be presented on one day and, as homework for the next day, trainees should be required to bring some job experiences for review, comparison and discussion.

Checks

1. Written
2. Class participation in discussion

OBJECTIVE 1-3

Gain a detailed knowledge of rock characteristics and formations.

Location
1. Classroom

Task
Comprehend rock formations and characteristics and relate this knowledge to bit selection.

Teaching points
1. Review of rock characteristics and formations (see Level One, OBJECTIVE 1-9)
2. Rock hardness and bit wear

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Training aids
1. Mineral samples

Remarks
This objective should be tied to Level Two, OBJECTIVE 8-1 (Diamond bit selection and running parameters).

Checks
1. Written

References
1. Course notes
2. Drillers Handbook (chap. 7, tables 8 and 9)

OBJECTIVE 1-4

Gain a detailed knowledge of communication in the work environment with specific emphasis on working with co-workers, and demonstrate a skilled ability to receive and deliver industry-related instructions.

Location

1. Classroom

Task

Participate in class exercises and demonstrate an understanding of the subject material and an ability to apply it.

Teaching points

1. The communication process
2. Ways of reducing wrong information
3. Factors influencing each person's point of view
4. Suggestions for getting along with others
5. Procedures for communicating in an emergency

Teaching methods

This subject should be presented as a class discussion. Both good and bad examples should be presented and discussed.

Periods allotted

3 x 50 minutes

Checks

1. Assessment based on class participation

OBJECTIVE 1-5

Gain a basic knowledge of the way a meeting is conducted and how to participate and present information.

Location
1. Classroom

Task
Comprehend the manner in which meetings are conducted and demonstrate the confidence to participate effectively.

Teaching points
1. Type or purpose of the meeting
    - Presentation and exchange of information
    - Dissemination of information
    - Discussion, consensus or decision
2. Format
    - Agenda
    - Presentations
    - Discussion
    - Minutes
    - Follow-up

Teaching methods
1. Lecture
2. Class participation

Period allotted
1 x 50 minutes

Remarks
The teaching points should be covered in a lecture and confirmed in a practice meeting in which all trainees are given the opportunity to participate.

Checks
1. Assessment based on class participation.

OBJECTIVE 1-6

Gain a detailed knowledge of the completion of progress proformas.

Location
1. Classroom

Task
Become familiar with the progress proformas used by WDDCA members and understand how to complete them.

Teaching points
1. Importance of progress proformas
    - Job diary
    - Cost information
2. Information found on proformas
3. Completion of the proforma
4. Distribution upon completion

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
2 x 50 minutes

Training aids
1. Progress proformas

Remarks
Each WDDCA member should be encouraged to be represented at this presentation. The proformas and procedures of each member should be presented and practiced. Each trainee should complete several proformas from a given narrative.

Checks
1. Written

OBJECTIVE 1-7

Gain a basic knowledge of the completion of accident reports.

Location
1. Classroom

Task
Become familiar with accident forms used by WDDCA members and the Workers Compensation Board, and understand the importance and use of these forms.

Teaching points
1. WDDCA accident reports
2. WCB accident reports
3. WCB regulations regarding accidents

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Period allotted
1 x 50 minutes

Training aids
1. Accident reports

Remarks
Each WDDCA member should be encouraged to be represented at this presentation. The forms and procedures of each member should be presented and practiced as well as the WCB forms. Each trainee should complete several forms from a given narrative.

Checks
1. Written

OBJECTIVE 2-1

Cultivate safe work habits.

Location
1. Classroom

Task
Demonstrate that safe work habits are employed at all times.

Teaching points
1. Definition of an accident
2. Cause of accidents
    - An act
    - A condition
3. The diamond drillers five points safety system
4. Reporting or correcting unsafe conditions

Teaching methods
1. Lecture
2. Continuous assessment and comment

Period allotted
1 x 50 minutes

Remarks
One period should be allotted to review safety. The trainees should be assessed throughout the course on their observation of proper safety habits.

Checks
1. Assessment throughout the course.

OBJECTIVE 3-1

Gain a basic knowledge of mobilization and demobilization including instructions, checklists, travel details and routes and carriers.

Location

1. Classroom

Task

Become familiar with instructions and information that may be received on the job, in order to assist the driller and offer guidance to the helper.

Teaching points

1. Instructions
   - Equipment assembly
   - Timings
   - Routes
   - Accommodations
   - Coordination
2. Travelling
   - Maintaining a good image
   - Meeting a planned schedule
   - Maintaining contact with office
3. Checklists
   - Purpose
   - Checklist items
   - Checking condition
   - Sequence of loading

Teaching methods

1. Lecture
2. Discussion

Periods allotted

3 x 50 minutes

Training aids

1. Standard WDDCA member forms (if used)

Checks

1. Written

OBJECTIVE 3-2

Gain a detailed knowledge of the principles of loading and unloading vehicles.

Location
1. Classroom

Task
Comprehend the principles of loading and unloading vehicles in order to work without supervision and direct the work of assistants.

Teaching points
1. Classification of vehicles
2. Packing and crating of goods
3. Weight distribution
4. Tying down
5. Protection from the elements
6. Height, weight and width restrictions

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Checks
1. Written (It may also be helpful to create situations for the trainees to critique.)

OBJECTIVE 3-3

Gain a basic knowledge of inventory, storing, and checking and reordering equipment and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Become familiar with the procedures in order to be skilled in inventory and checking and able to assist in documentation and reordering, with supervision in the field.

Teaching points
1. Unloading and storage
2. Inventories and records
3. Reordering equipment

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. WDDCA members forms and procedures

Remarks
Members of WDDCA should be encouraged to be represented at this presentation. The forms and procedures of each member should be presented and practiced.

Checks
1. Written

OBJECTIVE 4-1

Gain a basic knowledge of the location, layout and preparation of a campsite.

Locations
1. Classroom

Task
Gain sufficient knowledge of the subject to locate, lay out and prepare a campsite under minimal supervision.

Teaching points
1. Sites according to government regulations
2. Situating camp components
3. Location of fire fighting equipment

Teaching methods
1. Lecture
2. Class exercise

Periods allotted
2 x 50 minutes

Training aids
1. Survey layout equipment
2. Survey, photo and map information or actual site

Remarks
The principles should be taught in a lecture followed by an assignment. The class should be divided into groups of four or five, and the groups given enough information, or a visit to the site, to complete a location and layout plan. This objective should be taught in conjunction with OBJECTIVES 4-2, 4-3, and 4-6.

Checks
1. Written
2. Assessment of project

OBJECTIVE 4-2

Gain a detailed knowledge of the erection of camp structures and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to erect field structures and supervise the work of others.

Teaching points
1. Housing tents
2. Dry tents
3. Kitchen
4. Setting up and levelling trailer camps

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Remarks
Detailed in OBJECTIVE 4-1.

Checks
1. Written

OBJECTIVE 4-3

Gain a basic knowledge of the layout and erection of camp facilities and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to participate in the erection of camp facilities under minimal supervision.

Teaching points
1. The tools, materials and layout requirements of:
   - Water system
   - Fire protection
   - Sanitary facilities
   - Heating

Teaching methods
1. Lecture
2. Class project

Periods allotted
2 x 50 minutes

Remarks
Detailed in OBJECTIVE 4-1.

Checks
1. Written

OBJECTIVE 4-4

Gain a basic knowledge of setting up radio equipment and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate an ability to set up radio equipment under minimal supervision.

Teaching points
1. Types of radio equipment
2. Characteristics of the equipment
3. Frequencies and tuning
4. Radio conditions
5. Power supply
6. Antennas

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Radio equipment

Checks
1. Written
2. Skill check

OBJECTIVE 4-5

Gain a basic knowledge of winterizing the camp and equipment and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate the ability necessary to winterize the camp and equipment under minimal supervision.

Teaching points
1. Effects of cold, ice and snow
2. Vulnerable points in camp and equipment
3. Winter protection measures
4. Operating in the winter
5. Long term winter storage

Teaching methods
1. Lecture
2. Equipment demonstration

Periods allotted
2 x 50 minutes

Training aids
1. Drilling equipment

Remarks
Emphasize the fact that frozen equipment can cause damage and delays.

Checks
1. Written

OBJECTIVE 4-6

Gain a basic knowledge of the procedures for the dismantling and cleanup of the camp and camp equipment and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a general knowledge of the tasks, procedures and sequence involved in dismantling and cleanup in order to perform the procedures without supervision.

Teaching points
1. Tasks required
   . Tents
   . Equipment and facilities
2. Sequence of the work
3. Final cleanup

Teaching methods
1. Lecture
2. Class practice

Period allotted
1 x 50 minutes

Remarks
Detailed in OBJECTIVE 4-1.

Checks
1. Written

OBJECTIVE 5-1

Gain a basic knowledge of selecting, locating and preparing routes to camp and drill sites.

Locations
1. Classroom
2. Field exercise area

Task
Gain sufficient knowledge of the subject to select, locate and prepare routes to camp and drill sites under minimal supervision.

Teaching points
1. Methods of locating and marking routes
2. Factors affecting route location
3. Overcoming obstructions
4. Locating roads and trails to minimize damage to terrain

Teaching methods
1. Lecture
2. Practical examples of procedure and principles

Periods allotted
4 x 50 minutes

Training aids
1. Flagging and blazing materials

Checks
1. Written

OBJECTIVE 5-2

Gain a basic knowledge of moving drills from the off-load site to the drill site.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to undertake some of the move tasks with guidance.

Teaching points
1. Manpower efficiency
2. Sequence of moving equipment
3. Loading and travelling

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 5-3

Gain a basic knowledge of the location and installation of the water system for the camp.

Locations
1. Classroom
2. Work area
3. Field study area

Task
Gain sufficient knowledge of the subject to locate and install a water system in the field under minimal supervision.

Teaching points
1. Sources of water
2. Capacity of sources
3. Water intake
4. Piping requirements
5. Pump requirements
6. Winter conditions

Teaching methods
1. Lecture
2. Demonstration
3. Discussion

Periods allotted
7 x 50 minutes

Training aids
1. Water system equipment

Remarks
The subject material should be covered in a lecture followed by a demonstration with the equipment. A visit should then be made to a nearby site to confirm the principles covered through demonstration and discussion.

Checks
1. Written

OBJECTIVE 5-4

Gain a detailed knowledge of checking oil, fuel, water and hydraulic systems and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Become familiar with the procedures and demonstrate an ability to check out oil, fuel, water and hydraulic systems.

Teaching points
1. Reasons for checking systems
2. Components to be checked
3. Fuel and oil lines
4. Water lines
5. Hydraulic lines
6. Tanks and reservoirs
7. Fluid purity
8. Filters
9. Instrumentation

Periods allotted
2 x 50 minutes

Training aids
1. Equipment

Checks
1. Written
2. Skill check

OBJECTIVE 6-1

Gain a basic knowledge of the various means of locating the drill hole and interpreting the stake markings and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a basic knowledge of the subject and demonstrate an ability to position equipment with minimal guidance.

Teaching points
1. Means used to locate the collar
2. Markings of the collar stake
3. Locating the front and back sights
4. Clearing and levelling the ground

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Locating equipment

Remarks
The objective should be covered in a lecture and demonstration. The remaining time should be used to develop confidence and competence through practice.

Checks
1. Written
2. Skill assessment

OBJECTIVE 6-2

Gain a detailed knowledge of site clearance and foundation construction and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to complete foundation construction without supervision.

Teaching points
1. Materials and tools required
2. Sequence and labour times
3. Constructing foundations
   - Bare ground
   - Wooden sills
   - Cement
   - Logs
   - Cribbing
4. Setting up on ice
5. Anchoring the drill

Teaching methods
1. Lecture
2. Demonstration
3. Class participation

Periods allotted
5 x 50 minutes

Training aids
1. Foundation materials
2. Tools

Remarks
At least a partial foundation of each type should be constructed and each trainee should be responsible for a part.

Checks
1. Written
2. Skill check

OBJECTIVE 6-3

Gain a detailed knowledge of positioning the drill on the foundation in line with the backsight and frontsight and demonstrate a semi-skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate an ability to mount the drill.

Teaching points
1. Methods used to place drills
2. Assembling drills on foundations
3. Uses of ramps and gin poles
4. Aligning the drill
   . Positioning the swivel head
   . Sighting with swivel head on front and back sights
5. Securing the drill
6. Lining up a unitized drill

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
5 x 50 minutes

Training aids
1. Drill
2. Foundation
3. Degree rule
4. Crow bars

Checks
1. Written
2. Skill check

OBJECTIVE 6-4

Gain a detailed knowledge of locating and installing water line pumps and heaters and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to locate and install water line pumps and heaters without supervision.

Teaching points
1. Layout of a water system
2. Terms and definitions
3. Setting up and operating pumps
4. Piping connections
5. Basic hydraulics
6. Setting up heaters
7. Suction strainers and foot valves
8. Relief valves

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Pumps and heaters
2. Installation tools
3. Hose

Checks
1. Written
2. Skill assessment

OBJECTIVE 6-5

Gain a detailed knowledge of setting up a mud system and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to set up and operate a mud system without supervision.

Teaching points
1. Terms and definitions
2. Reasons for using mud
3. Equipment required to test mud consistency
4. Materials and equipment
5. Equipment layout
6. Mixing and testing procedures

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Mud balance
2. Marsh funnel and cup
3. Rheometer
4. PH paper
5. Filter press
6. Mud tank
7. Bentonite
8. Mud mixer

Remarks
Emphasis should be placed on review and confirmation of the trainee's confidence and competence. This objective should be taught in conjunction with OBJECTIVE 10-4 (Use of air and foam).

Checks
1. Written
2. Skill check

OBJECTIVE 6-6

Gain a detailed knowledge of erecting the floor and drill shack.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to erect the floor and drill shack without supervision.

Teaching points
1. Drill floors
    - Necessity for solid decks
    - Materials and tools
    - Procedure
2. Drill shacks
    - Definition and purpose
    - Type
    - Materials
    - Building procedures
    - Safety features
    - Lighting
3. Sequence and organizing the work

Teaching methods
1. Lecture
2. Demonstration
3. Skill confirmation

Periods allotted
7 x 50 minutes

Training aids
1. Tools
2. Material

Checks
1. Written
2. Skill check

OBJECTIVE 6-7

Gain a detailed knowledge of the use and erection of derricks, masts and baskets and demonstrate a skilled ability to perform the procedures. Be familiar with improvisation using tripods.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to perform erection procedures in the field without supervision.

Teaching points
1. Assembly of derricks and masts
2. Raising derricks
3. Placing baskets
4. Raising masts
5. Guy wires
6. Tripods

Teaching methods
1. Lecture
2. Demonstration
3. Skill evaluation

Periods allotted
7 x 50 minutes

Training aids
1. Drill
2. Derrick, mast and basket
3. Rigging equipment

Remarks
Emphasis should be placed on confirming the trainee's confidence and competence in erection procedures.

Checks
1. Skill check

OBJECTIVE 6-8

Gain a detailed knowledge of tear down and move and storage operations and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to perform move and storage operations without supervision.

Teaching points
1. Tasks, manpower requirements and sequence
2. Pulling rods and casings
3. Safety procedures
4. Dismantling and storing drill sheds
5. Removal of support equipment
6. Lowering derricks
7. Servicing and storing drilling equipment

Teaching methods
1. Lecture
2. Practice
3. Skill evaluation

Periods allotted
7 x 50 minutes

Training aids
1. Drill

Remarks
Move and storage operations should be repeated until each trainee's competence is confirmed.

Checks
1. Oral
2. Skill check

OBJECTIVE 7-1

Gain a detailed knowledge of the operation and maintenance of support equipment and demonstrate a semi-skilled ability to perform the procedures with mobile equipment, and a skilled ability to perform the procedures with fixed equipment.

Locations
1. Classroom
2. Work area

Task
Pass a written examination and demonstrate either a skilled or semi-skilled ability to maintain and operate support equipment (as specified on the list below):
1. Fixed equipment (skilled)
    - Gas and diesel engines
    - Propane equipment
    - Compressors
    - Fuel storage containers
    - Generators
2. Mobile equipment (semi-skilled)
    - Water trucks
    - Motor boats
    - Cats and skidders
    - Muskegs and skidoos
    - Trucks

Teaching points
As detailed on supplementary sheets (see 7-1a, 7-1b, and 7-1c).

Teaching methods
1. Lecture
2. Practice

Periods allotted
Detailed on supplementary sheets.

Training aids
Detailed on supplementary sheets.

Checks
1. Written
2. Skill check

SUPPLEMENTARY SHEET 7-1a

Subject

1. Gas engines and diesel engines

Teaching points

1. Inspection
   - . Fuel lines
   - . Electrical
   - . Cooling system
   - . Exhaust system
2. Starting and operating
3. Engine indicators (gauges)
4. Maintenance

Periods allotted

2 x 50 minutes

Training aids

1. Engines
2. Service tools

Subject

1. Propane equipment

Teaching points

1. Components
2. Transporting, installing and storing propane
3. Effects of temperature on pressure

Period allotted

½ x 50 minutes

Subject

1. Compressors and generators

Teaching points

1. Starting and operating
2. Maintenance

Period allotted

½ x 50 minutes.

Training aids

1. Compressor
2. Tools
3. Generators

SUPPLEMENTARY SHEET 7-1b

Subject
1. Fuel storage containers

Teaching points
1. Locating and installing
2. Safety
3. Inspection
4. Using

Period allotted
$\frac{1}{2}$ x 50 minutes

Training aids
1. Fuel storage containers

Subject
1. Trucks

Teaching points
1. Operating
2. Inspection and maintenance

Period allotted
1 x 50 minutes

Training aids
1. Trucks

Subject
1. Water trucks

Teaching points
1. Operation
2. Servicing

Period allotted
$\frac{1}{2}$ x 50 minutes

Training aids
1. Water truck

SUPPLEMENTARY SHEET 7-1c

Subject
1. Motor boats

Teaching points
1. Starting and operating
2. Maintenance

Period allotted
1 x 50 minutes

Subject
1. Cats
2. Skidders

Teaching points
1. Starting and operating
2. Maintenance

Periods allotted
2 x 50 minutes

Subject
1. Muskegs
2. Skidoos

Teaching points
1. Starting and operating
2. Maintenance

Period allotted
1 x 50 minutes

OBJECTIVE 7-2

Gain a basic knowledge of the operation and maintenance of a camp water system and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a knowledge of the subject and demonstrate the skills required to maintain and operate the camp water system and pumps.

Teaching points
1. Layout of a water system
2. Setting and servicing pumps
3. Piping connections
4. Setting and servicing water heaters

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Period allotted
1 x 50 minutes

Training aids
1. Water system equipment

Checks
1. Skill check

OBJECTIVE 8-1

Gain a detailed knowledge of diamond bit selection and running parameters for various bit types and demonstrate a skilled ability to operate impregnated and diamond bit sets.

Location
1. Classroom

Task
Comprehend the design, selection and use of diamond tools in order to select and use them in the field, with guidance.

Teaching points
1. Shapes of bits
2. Distribution of diamonds in bits
3. Rock hardness and bit wear
4. Drilling precautions
5. Bit pressure, rotational speed and penetration rate

Teaching methods
1. Lecture
2. Demonstration

Periods allotted
3 x 50 minutes

Training aids
1. Selection of bits, shells and shoes

Remarks
This objective should be taught in conjunction with OBJECTIVE 1-3 (Rock characteristics and formations).

Checks
1. Written

OBJECTIVE 8-2

Gain a detailed knowledge of the assembly and maintenance of down hole tools and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to assemble and maintain down hole tools without supervision.

Teaching points
1. Types and description of core barrels
2. Core tube
3. Overshot
4. Drill rods

Teaching methods
1. Lecture
2. Demonstration
3. Practice

Periods allotted
3 x 50 minutes

Training aids
1. Down hole tools
2. Core barrels

Remarks
Emphasis should be placed on the correct assembly and adjustment and checking for wear, damage and parts replacement.

Checks
1. Written
2. Skill check

OBJECTIVE 8-3

Gain a detailed knowledge of the assembly and maintenance of surface tools and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to assemble and maintain surface tools without supervision.

Teaching points
1. Type sizes and uses of foot clamps
2. Assembling and using foot clamps
3. Types sizes and uses of pipe wrenches
4. Adjusting and using pipe wrenches
5. Description and uses of inner tube wrenches
6. Assembling and using lowering irons
7. Other types of hoisting equipment
8. Checking for wear and damage
9. Hoisting plugs
10. Water swivels
11. Holding dogs
12. Stuffing boxes

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
2 x 50 minutes

Training aids
1. Foot clamps
2. Pipe wrenches
3. Lowering irons
4. Inner tube wrenches
   (Damaged and worn equipment should be included.)

Remaks
Emphasis should be placed on correct assembly and checking for wear, damage and parts replacement.

Checks
1. Written
2. Skill check

OBJECTIVE 8-4

Gain a detailed knowledge of the assembly and maintenance of diamond tools and demonstrate a skilled ability to perform the procedures.

Locations

1. Classroom

Task

Demonstrate an ability to assemble and maintain diamond tools without supervision.

Teaching points

1. Checking diamond bits
2. Checking reaming shells
3. Maintenance and assembly
4. Using bit and shell gauges

Teaching methods

1. Lecture
2. Demonstration
3. Class practice

Periods allotted

2 x 50 minutes

Training aids

1. Diamond bits
2. Reaming shells
3. Gauges
   (Used bits and shells should be included.)

Remarks

Emphasis should be placed on correct assembly and checking for wear, damage and parts replacement.

Checks

1. Written
2. Skill check

OBJECTIVE 9-1

Gain a detailed knowledge of the operation of the drill and demonstrate a skilled ability to perform the procedures.

Location
1. Work area

Task
Demonstrate an ability to perform normal drilling operations without supervision.

Teaching points
1. Starting and operating
2. Types and reasons for starting aids
3. Drill engine indicators
4. Engaging clutch
5. Transmissions
6. Controls for hoisting and drilling
7. Penetration control
8. Manual and hydraulic chucks

Teaching methods
1. Demonstration
2. Class practice

Periods allotted
7 x 50 minutes

Remarks
Emphasis should be placed on developing confidence and a sense of the routine in the trainee.

Checks
1. Oral
2. Skill check

OBJECTIVE 9-2

Gain a detailed knowledge of overburden drilling and demonstrate a skilled ability to perform the procedures.

Location
1. Work area

Task
Demonstrate an ability to perform overburden drilling without supervision.

Teaching points
1. Methods used to penetrate overburden
2. Sealing casing in bedrock
3. Alignment and degree rules
4. Types of bits
   - Casing bits
   - Casing shoes
   - Carbide bits
   - Tricone bits
   - Drive shoes
5. Drive hammers
6. Slip rope drums

Teaching methods
7 x 50 minutes

Training aids
1. Drill

Remarks
This objective may be taught in conjunction with OBJECTIVE 9-3 (Overburden casing) to ensure that each trainee receives adequate time to practice and confirm the necessary skills.

Checks
1. Oral
2. Skill check

OBJECTIVE 9-3

Gain a detailed knowledge of casing the overburden and demonstrate a skilled ability to perform the procedures.

Location
1. Work area

Task
Demonstrate an ability to perform normal casing operations without supervision.

Teaching points
1. Casing requirements
2. Techniques for installing casing
3. Costs and likely problems

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Drill
2. Casing tools and equipment

Remarks
This objective may be taught in conjunction with OBJECTIVE 9-2 (Overburden drilling) to ensure that each trainee receives adequate time to practice and confirm the necessary skills.

Checks
1. Written
2. Skill check

OBJECTIVE 9-4

Gain a detailed knowledge of starting the coring operations and demonstrate a skilled ability to perform the procedures.

Location
1. Work area

Teaching points
1. Lowering core barrel and rods into the hole
2. Closing the swivel head
3. Connecting the water swivel
4. Tightening the chuck
5. Drilling until blocking
6. Retrieving inner tube and core
7. Likely problems and solutions
8. Care of the core

Teaching methods
1. Demonstration
2. Class practice

Periods allotted
14 x 50 minutes

Training aids
1. Drill

Checks
1. Oral
2. Skill check

OBJECTIVE 9-5

Gain a basic knowledge of the meaning and interpretation of orders regarding stopping hole.

Location
1. Classroom

Task
Comprehend the meaning and interpretation of orders sufficiently to report to the supervisor when conditions are met.

Teaching points
1. Economics
2. Reasons for stopping hole
    - Depth
    - Type of material recovered
    - Lack of progress
    - Recovery of core and material
3. Action to be taken (continue, shut-down, notification, etc.)
4. Routine for reporting (chain of command)

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 10-1

Gain a detailed knowledge of the requirements, preparation and set up for fluids and lubricants.

Location
1. Classroom

Task
Become familiar with fluids and lubricants and demonstrate an ability to prepare and use them without supervision.

Teaching points
1. Reasons for lubrication
2. Types of lubricants
3. Parts which require lubricants
4. Lubrication requirements
5. Lubrication procedures

Period allotted
1 x 50 minutes

Training aids
1. Lubricants
2. Equipment

Checks
1. Written

OBJECTIVE 10-2

Gain a detailed knowledge of the mud technique and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to use mud.

Teaching points
1. Terms and definitions
2. Reasons for using mud
3. Material and equipment
4. Equipment layout
5. Mixing and testing

Teaching method
1. Lecture
2. Practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill
2. Equipment

Checks
1. Written
2. Skill check

OBJECTIVE 10-3

Gain a detailed knowledge of the use of water and rod greases and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate the skills necessary to use water and rod greases.

Teaching points
1. Reasons for lubrication
2. Types of lubricants
3. Parts requiring lubricants
4. Lubrication procedures

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill rods
2. Rod greases
3. Linseed soap
4. Soluble oils
5. Dispensers
6. Graphite grease

Checks
1. Written
2. Skill check

OBJECTIVE 10-4

Gain a basic knowledge of the use of air and foam and demonstrate a limited ability to perform the procedures.

Location
1. Classroom

Task
Become familiar with the use of air and foam in order to perform the procedures.

Teaching points
1. Definition and terms
2. Reasons for using air and foam
    - Economy
    - Recovery of chips by floatation
3. Equipment used
4. Techniques
5. Problems encountered

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Remarks
This objective should be taught in conjunction with OBJECTIVE 6-5 (setting up a mud system).

Checks
1. Written

OBJECTIVE 11-1

Gain a detailed knowledge of cementing, grouting and caping a hole and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate the skills necessary to cement, grout, and cap a hole in the field without supervision.

Teaching points
1. Types of cement
2. Mixing and placing procedures
3. Why cementing is used
4. Determine how much cement to use

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill
2. Cement and grouting materials

Checks
1. Written
2. Skill check

OBJECTIVE 11-2

Gain a basic knowledge of reaming techniques and demonstrate a limited ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to participate in reaming procedures under direct supervision.

Teaching points
1. Definition and terms
2. Reasons for reaming
   . Water
   . Sand
   . Cave-in
3. Reaming vs. cementing
4. Equipment and procedure
5. Reaming through cave-in
6. Reaming through sqeezing ground
7. Under-reaming

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Drill
2. Casing
3. Casing shoe
4. Reaming bits and pilots
5. Under-reaming

Remarks
Consideration should be given to combining this objective with other operations to provide more practice time.

Checks
1. Written
2. Skill check

OBJECTIVE 11-3

Gain a basic knowledge of fishing techniques and demonstrate a limited ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to participate in fishing procedures under adequate supervision.

Teaching points
1. Definition, terms and reasons for fishing
2. Special equipment
3. Techniques and procedure

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Taps
2. Rod taps and bell taps (left and right)
3. Casing taps
4. Spears
5. Left hand casing
6. Bit recovery taps
7. Casing cutters

Checks
1. Written
2. Skill check

OBJECTIVE 11-4

Gain a detailed knowledge of drilling with lost circulation and demonstrate an ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Become familiar with the steps to be taken upon loss of circulation and demonstrate an ability to perform the procedures.

Teaching points
1. Definition of lost circulation
2. Likely causes
    - Fractures
    - Cavities
    - Fault
3. Procedures using water
    - Slow drill
    - Vibration problems
4. Procedures using mud
    - Use of lost circulation material
5. Using cuttings to get circulation return

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Period allotted
1 x 50 minutes

Training aids
1. Drill

Remarks
This procedure should be practiced during other periods using the drill.

Checks
1. Written
2. Skill check

OBJECTIVE 11-5

Gain a detailed knowledge of drilling through faults.

Location
1. Classroom

Task
Gain sufficient knowledge of the procedures to carry out the operations in the field without supervision.

Teaching points
1. Types and extent of faults
2. Indications of a fault
   - Loss of core
   - No bit pressure
   - Bit blockage
   - Change of rock (mud)
3. Procedures to overcome faults
   - Reaming, grouting and modifying the mud

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 11-6

Gain a detailed knowledge of the methods of hole survey and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate the skills necessary to perform survey operations in the field without supervision.

Teaching points
1. Definitions and methods
2. Testing equipment
3. Information from surveying the drill hole
4. Wedging to correct hole alignment

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Culture tube
2. 4% acid
3. Clinometer
4. Liquid gelatin
5. Compass
6. Non-magnetic rods
7. Compass with clockwork mechanism
8. Photographic

Checls
1. Written
2. Skill check

OBJECTIVE 11-7

Gain a basic knowledge of setting wedges and demonstrate a semi-skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to participate in wedging operations under supervision.

Teaching points
1. Definition and reasons for wedging
2. Types of wedges
    - Deflecting
    - Directional
    - Retrievable
    - By-pass
3. Use of:
    - Wedge reaming shells
    - Universals
    - Short rods
    - Bull nose bit
4. Techniques and procedures

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Drill
2. Clinometer
3. Acid
4. Wedges

Checks
1. Written
2. Skill check

OBJECTIVE 11-8

Gain a detailed knowledge of applying control drilling techniques.

Location
1. Classroom

Task
Comprehend the requirements of control drilling in order to work as directed when drilling.

Teaching points
1. Authority and instructions relating to control drilling.
2. Reasons for control drilling
3. Actions by the driller
4. Mini-deve core barrel
5. Straight hole core barrel
6. Effects of various bits on control drilling

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 11-9

Gain a basic knowledge of setting and maintaining blow-out preventers, and demonstrate an ability to peform the procedures.

Location
1. Classroom

Task
Gain sufficient knowledge to comprehend the procedures and demonstrate an ability to help set and maintain blow-out preventers.

Teaching points
1. Definition
2. Reasons for use
3. Equipment
4. Procedure
5. Regulations governing use

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Period allotted
1 x 50 minutes

Training aids
1. Blow out preventers

Checks
1. Written
2. Skill check

OBJECTIVE 11-10

Gain a basic knowledge of drilling using reverse circulation.

Location

1. Classroom

Task

Comprehend the subject in order to participate in field procedures.

Teaching points

1. Definitions
2. Reasons for use
    - Unusual rock conditions
    - Coring overburden
3. Equipment used
4. Procedures

Teaching method

1. Lecture

Period allotted

1 x 50 minutes

Remarks

This objective should be tied in with OBJECTIVE 10-4 (Use of air and foam).

Checks

1. Written

OBJECTIVE 11-11

Gain a detailed knowledge of recovering sludge samples.

Location
1. Classroom

Task
Gain sufficient knowledge of the subject to perform sludge sampling.

Teaching points
1. Reasons for sludge collection
2. Methods of sludge collection
   - Tub
   - Sludge box
   - Thompson sludge cutter
3. Permanent filing of samples

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Training aids
1. Photographs
2. Slides
2. Thompson sludge cutter

Remarks
This objective is a review and confirmation of the material covered in level one.

Checks
1. Written

OBJECTIVE 11-12

Gain a basic knowledge of taking soil samples.

Location
1. Classroom

Task
Gain sufficient knowledge of taking soil samples to participate in field procedures.

Teaching points
1. Definitions
2. Reasons for involvement by diamond drillers
3. Procedures

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 11-13

Gain a detailed knowledge of casing recovery and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate an ability to conduct casing recovery without supervision.

Teaching points
1. Definition
2. Breaking free
    - Pulling
    - Explosives
    - Jarring
    - Jacking
    - Casing cutters
    - Hydraulic casing cutters

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill
2. Jacks
3. 250 lb. jar hammer

Remarks
The trainee should be familiar with how explosives are used but is not required to have a detailed knowledge or skilled ability in this area.

Checks
1. Written
2. Skill check

OBJECTIVE 11-14

Gain a basic knowledge of the triple tube coring technique.

Location
1. Classroom

Task
Gain sufficient knowledge of the triple tube coring technique to participate in field procedures.

Teaching points
1. Definitions
2. Reasons for use
    - Friable ground
    - Coal
    - Undisturbed sample
3. Equipment used
4. Procedures

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Training aids
1. Triple tube equipment

Checks
1. Written

OBJECTIVE 12-1

Gain a detailed knowledge of the construction and maintenance of a heliport and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Gain a knowledge of the subject and demonstrate the skills necessary to construct and maintain a heliport without supervision.

Teaching points
1. Description and characteristics of helicopters
2. Approach and departure requirements
3. Pad requirements (size and construction)
4. Labour and materials planning
5. Sequence of construction
6. Maintenance requirements

Teaching methods
1. Lecture
2. Work session

Periods allotted
4 x 50 minutes

Training aids
1. Tools

Remarks
The work session of this objective is required only to confirm any necessary special techniques and should be combined with OBJECTIVE 12-2 (Construction of docks and ramps).

Checks
1. Written
2. Skill check

OBJECTIVE 12-2

Gain a detailed knowledge of constructing a dock or ramp for fixed wing aircraft and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate an ability to construct docks and ramps without supervision.

Teaching points
1. Description and characteristics of aircraft
2. Docking and ramp requirements
3. Construction details
4. Labour and materials planning
5. Sequence of construction
6. Maintenance requirements

Teaching methods
1. Lecture
2. Work session

Periods allotted
2 x 50 minutes

Training aids
1. Tools

Remarks
The work session of this objective is required only to confirm any necessary special techniques and should be combined with OBJECTIVE 12-1 (Construction of a heliport).

Checks
1. Written
2. Skill check

OBJECTIVE 13-1

Gain a basic knowledge of hydraulic systems as applied to drilling equipment and demonstrate a limited ability to conduct minor repairs.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to check a hydraulic system and perform minor repairs under supervision.

Teaching points
1. Description of a hydraulic system
2. Potential sources of trouble
3. Disconnecting and connecting lines
4. Replacing seals
5. Check-out
6. Filters

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Tools
2. Seals
3. Hydraulic system

Checks
1. Written
2. Skill check

OBJECTIVE 13-2

Gain a basic knowledge of elementary diesel engine repairs and demonstrate a limited ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to check an engine and perform minor repairs under supervision.

Teaching points
1. Description of the diesel engine
2. Potential sources of trouble
3. Changing filters
4. Checking injectors
5. Change automotive transmission
6. Priming

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Diesel engine
2. Tools
3. Damaged and worn parts

Checks
1. Written
2. Skill check

OBJECTIVE 13-3

Gain a basic knowledge of cutting and welding tasks and demonstrate a limited ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate an ability to perform simple cutting tasks in order to work in the field under supervision. This objective should establish a background upon which to develop further skill in the field.

Teaching points
1. Description and characteristics of cutting equipment
2. Techniques of cutting
3. Safety considerations
4. Uses in diamond drilling

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Cutting and welding equipment
2. Material

Remarks
This objective should ensure that the trainee has sufficient knowledge of safety and procedures to allow further development in the field.

Checks
1. Written
2. Skill check

OBJECTIVE 13-4

Gain a basic knowledge of electrical fault finding and repairs as applied to motors and camp electrical systems and demonstrate a limited ability to perform repairs.

Location
1. Classroom

Task
Comprehend the subject and demonstrate an ability to find and correct minor faults under close supervision.

Teaching points
1. Components, layout and characteristics of circuits and motors
2. Using test equipment to test for current and circuit continuity
3. Probable faults
4. Correcting faults
5. Automotive type generators and alternators
6. Fuses

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Testing equipment
2. Tools
3. Electric motors and circuits
4. Generators
5. Shack and mast circuit

Checks
1. Written
2. Skill check

LEVEL 3 COURSE OUTLINE

Summary of Level 3 Course Outline

		No. of Periods
1-1:	Need for confidentiality	1
1-2:	Reasons and objectives of different drilling strategies	1
1-3:	Preparation of progress reports	4
1-4:	Completing accident reports	2
2-1:	Temporary care of sick and injured	7
2-2:	Environment and wildlife protection	1
2-3:	Calculations and safety using cables, chains, ropes and jacks	4
3-1:	Mobilization instructions	2
3-2:	Procedures for inventory, storing checking and reordering	2
4-1:	Locating, layout and preparation of a campsite	4
4-2:	Layout and erection of camp facilities	3
4-3:	Setting up radio equipment	3
4-4:	Procedures for winterizing the camp and equipment	1
4-5:	Procedures for dismantling and cleanup of camp and equipment	4
5-1:	Selecting, locating and preparing route to camps and drill sites	11
5-2:	Moving drills from offload site to drill site	1
5-3:	Location and installation of the camp water system	2
6-1:	Locating the drill hole and interpreting stake markings	2
7-1:	Operation and maintenance of the drill water system	7
7-2:	Safety and use of explosives	7*
8-1:	Procedures of advanced mud techniques	7
8-2:	Use of air and foam	7
9-1:	Permafrost techniques	1
9-2:	Reaming techniques	11
9-3:	Fishing techniques	4
9-4:	Drilling with lost circulation	4
9-5:	Procedures for setting wedges	7
9-6:	Setting up and maintaining blow-out preventers	7

* An additional 4 periods may be required if certification by the mining inspector or WCB is required.

		No. of Periods
9-7:	Setting up on ice	1
9-8:	Drilling using reverse circulation	1
9-9:	Soil sampling techniques	3
9-10:	Triple tube process	2
10-1:	Hydraulics as applied to drilling	7
10-2:	Elementary repairs on a diesel engine	7
10-3:	Cutting and welding	7
10-4:	Minor repairs on electrical systems	7
	Examinations	7
	Administration	5
	Spare	5
	Total:	169 periods (4 weeks and 4 days)

OBJECTIVE 1-1

Gain a detailed knowledge of the need for confidentiality as applied to cost of operation and bidding.

Location
1. Classroom

Task
Comprehend the type of information that compromises a company.

Teaching points
1. The bidding and award process
2. Factors affecting a bid
3. Cost of operations
4. Effect of revealing information

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Remarks
The trainee should have a general understanding of how jobs are bidded and awarded.

Checks
1. Written

OBJECTIVE 1-2

Gain a detailed knowledge of the reasons and objectives for different drilling strategies.

Location
1. Classroom

Task
Comprehend the reasons and objectives for different drilling strategies.

Teaching points
1. Shelby tube, description and uses
2. Split tube sampler, description and uses
3. Piezometers, description and uses
4. Applying tricones to soil sampling
5. Hammer (compactability)

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 1-3

Gain a detailed knowledge of the preparation of progress reports and a basic knowledge of the principles of writing notes, memos and letters.

Location
1. Classroom

Task
Demonstrate an ability to produce a progress report and correspondence given a set of circumstances and data.

Teaching points
1. Subject content
2. Organization of points
3. Formats and rules of composition

Teaching methods
1. Lecture
2. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Reference notes and formats

Remarks
An afternoon session should be used to present the subject, supply the data and begin the assignments. A further review period can be used for confirmation of the material.

Checks
1. Written

OBJECTIVE 1-4

Gain a detailed knowledge of completing accident reports.

Location
1. Classroom

Task
Demonstrate an ability to accurately complete WDDCA and WCB accident forms based upon scenario information.

Teaching points
1. WDDCA accident reports
2. WCB accident reports
3. WCB regulations regarding accidents

Teaching methods
1. Lecture
2. Class practice

Periods allotted
2 x 50 minutes

Training aids
1. Accident reports
2. Scenario

Remarks
The accident reports and procedures of WDDCA members should be stressed.

Checks
1. Written

OBJECTIVE 2-1

Gain a detailed knowledge of the procedures for temporary care of the sick and injured and demonstrate a skilled ability to set up patient care facilities.

Location
1. Classroom

Task
Comprehend the subject and demonstrate an ability to independently care for the sick and injured until evacuation can be effected.

Teaching points
1. Reasons for site care
2. Communicating with a medical advisor
3. Facilities and equipment for site care
4. Methods of care

Periods allotted
7 x 50 minutes

Training aids
1. Medical equipment

Remarks
This objective should be taught by a home-nursing or extended-care instructor.

Checks
1. Written
2. Skill check

OBJECTIVE 2-2

Gain a detailed knowledge of the principles of environment and wildlife protection, including regulations.

Location
1. Classroom

Task
Comprehend the subject in order to monitor and advise lesser experienced co-workers.

Teaching points
1. Terms and definitions
2. Sources of pollution
3. Methods of controlling pollution
4. Wildlife control and protection
5. Government regulations

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes

Remarks
A representative of the Fisheries and Wildlife Branch should be invited to participate in a discussion of the subject.

Checks
1. Written

OBJECTIVE 2-3

Gain a detailed knowledge of the calculation of safe working loads and safety factors applying to the use of cables, chains, ropes, sprockets and jacks.

Location
1. Classroom

Task
Comprehend the safety factors and calculation of safe working loads required when using cables, chains, ropes, sprockets and jacks.

Teaching points
1. Safe working methods
2. Inspection of equipment and materials
3. Safety factors
4. Calculation of safe working loads

Teaching methods
1. Lecture
2. Class problems

Periods allotted
2 x 50 minutes

Checks
1. Written

OBJECTIVE 3-1

Gain a detailed knowledge of mobilization instructions including instructions, checklists, travel details and routes and carriers.

Location
1. Classroom

Task
Comprehend the subject in order to move the crew and equipment.

Teaching points
1. Instructions
    - Equipment assembly
    - Timings
    - Routes
    - Accommodation
    - Coordination
2. Travelling
    - Maintaining a good image
    - Meeting a planned schedule
    - Maintaining contact with the office
3. Checklists
    - Purpose
    - Checklist items
    - Checking condition
    - Sequence of loading

Teaching methods
1. Lecture
2. Discussion

Periods allotted
2 x 50 minutes

Training aids
1. WDDCA member travel documents

Checks
1. Written

OBJECTIVE 3-2

Gain a detailed knowledge of the procedures for inventory, storing, checking and reordering equipment.

Location
1. Classroom

Task
Comprehend the subject in order to carry out all the procedures without supervision.

Teaching points
1. Unloading and storage
2. Inventories and records
3. Reordering

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Training aids
1. WDDCA member documents

Remarks
WDDCA members should be encouraged to send a representative to explain the company policies and methods.

Checks
1. Written

OBJECTIVE 4-1

Gain a detailed knowledge of the location, layout and preparation of a campsite.

Locations
1. Classroom
2. Survey, photo and map information or actual site

Tasks
Demonstrate the procedures necessary to locate, layout and prepare a campsite.

Teaching points
1. Sites according to government regulations
2. Situating camp components
3. Location of fire fighting equipment

Teaching methods
1. Lecture
2. Class exercise

Periods allotted
4 x 50 minutes

Training aids
1. Survey layout equipment
2. Survey photo and map information

Remarks
One period should be spent reviewing OBJECTIVE 4-1, Level 2 Course (erect camp procedures).

OBJECTIVE 4-2

Gain a detailed knowledge of the layout and erection of camp facilities including water, fire protection, sanitary system and heating and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Comprehend the subject in order to layout and erect camp facilities and direct the work of others.

Teaching points
1. The tools, materials and layout requirements of:
   - A water system
   - Fire protection
   - A sanitary system
   - Heating
2. Planning and organization of the work

Teaching methods
1. Lecture
2. Class exercise

Periods allotted
3 x 50 minutes

Checks
1. Written

OBJECTIVE 4-3

Gain a detailed knowledge of the setting up of radio equipment and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate an ability to set up radio equipment.

Teaching points
1. Types of radio equipment
2. Characteristics of the equipment
3. Frequencies and tuning
4. Radio conditions
5. Power supply
6. Antennas

Teaching methods
1. Lecture
2. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Radio equipment

Checks
1. Written
2. Skill check

OBJECTIVE 4-4

Gain a detailed knowledge of winterizing the camp and equipment and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate an ability to perform the procedures necessary to winterize the camp and equipment.

Teaching points
1. Effects of ice and snow
2. Vulnerable points in camp and equipment
3. Winter protection measures
4. Operating in the winter
5. Long term winter storage

Teaching methods
1. Lecture
2. Demonstration on the equipment

Period allotted
1 x 50 minutes

Training aids
1. Drilling equipment

Checks
1. Written

OBJECTIVE 4-5

Gain a detailed knowledge of the dismantling and cleanup of the camp and camp equipment, and demonstrate a skilled ability to perform the procedures.

Location
1. Classroom

Task
Demonstrate an ability to dismantle and cleanup the camp and camp equipment and demonstrate an ability to direct the work of others.

Teaching points
1. Tasks required
    - Tents
    - Equipment and facilities
    - Trailers
2. Sequence of the work
3. Time and manpower planning
4. Final cleanup

Teaching methods
1. Lecture
2. Class project

Periods allotted
4 x 50 minutes

Training aids
1. Camp equipment

Checks
1. Skill check

OBJECTIVE 5-1

Gain a detailed knowledge of the principles of selecting, locating and preparing the routes to camps and drill sites.

Locations
1. Classroom
2. Field sites

Task
Comprehend the subject in order to select, locate and prepare routes to camps and drill sites.

Teaching points
1. Methods of locating and marking routes
2. Factors affecting route location
3. Overcoming obstructions
4. Route design
5. Sequence of construction
6. Manpower and equipment planning

Teaching methods
The theory should be covered in a lecture followed by a field problem. (The class can be divided into groups with each group providing a solution.)

Periods allotted
11 x 50 minutes

Training aids
1. Basic survey equipment

Checks
1. Written

OBJECTIVE 5-2

Gain a detailed knowledge of moving drills from the offload site to the drill site.

Location
1. Classroom

Task
Comprehend the principles of moving drills.

Teaching points
1. Manpower efficiency
2. Sequence of moving equipment
3. Loading and travelling

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 5-3

Gain a detailed knowledge of the procedures for locating and installing the camp water system.

Location
1. Classroom

Task
Comprehend the subject in order to locate and install a water system in the field.

Teaching points
1. Sources of water
2. Capacity of sources
3. Water intake
4. Piping requirements
5. Pump requirements
6. Winter conditions
7. Hydraulic calculations
8. Trouble shooting

Teaching method
1. Lecture

Periods allotted
2 x 50 minutes

Checks
1. Written

OBJECTIVE 6-1

Gain a detailed knowledge of the methods of locating the drill hole and interpreting stake markings and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate an ability to locate the drill hole for positioning of equipment.

Teaching points
1. Means used to locate the collar
2. Markings on the collar stake
3. Locating front and back sights
4. Clearing and levelling the ground

Teaching methods
1. Lecture
2. Markings on the collar stake
3. Locating front and back sights
4. Clearing and levelling the ground

Taeching methods
1. Lecture
2. Class practice

Training aids
1. Locating equipment

Checks
1. Written
2. Skill check

OBJECTIVE 7-1

Gain a detailed knowledge of the operation and maintenance of the drill water system and pumps and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to set up and operate the drill water system.

Teaching points
1. Layout of a water system
2. Set and operate pumps
3. Piping connections
4. Basic hydraulic calculations
5. Setting up heaters
6. Suction strainers and foot valves
7. Sequence of work

Teaching methods
1. Lecture
2. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Water system equipment

Checks
1. Written
2. Skill check

OBJECTIVE 7-2

Gain a detailed knowledge of the ability to the safe use of explosives as applied to diamond drilling and demonstrate a skilled ability to make up and place a simple charge.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate the skills necessary to safely use explosives as related to diamond drilling.

Teaching points
1. Explosive regulations
    - Safety
    - Transportation
    - Storage
    - Certification
2. Definitions, description and characteristics
    - Fuse assemblies
    - Commercial explosives
3. Making up a basic charge
4. Placing and firing

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
1. 7 x 50 minutes
2. Plus 4 x 50 minutes for certification if required

Training aids
1. Explosives

Checks
1. Written
2. Practical

OBJECTIVE 8-1

Gain a detailed knowledge of the procedures of advanced mud techniques.

Location
1. Classroom

Task
Comprehend the techniques of using and mixing mud.

Teaching points
As detailed by consultant.

Teaching methods
1. Lecture
2. Demonstration

Periods allotted
7 x 50 minutes

Training aids
As detailed by consultant.

Remarks
This subject should be taught by a commercial supplier or consultant.

Checks
1. Written

OBJECTIVE 8-2

Gain a detailed knowledge of the use of foam and skill in the ability to work using air and foam.

Location
1. Classroom
2. Drill
3. Work area

Task
The student must gain sufficient knowledge and proficiency to allow him to use air and foam.

Teaching points
1. When to use air and foam
2. Equipment used and layout
3. Techniques
4. Problems encountered

Teaching method
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Compressor

Checks
1. Written
2. Skill check

OBJECTIVE 9-1

Gain a basic knowledge of permafrost techniques.

Location
1. Classroom

Task
The student must gain a basic knowledge of permafrost techniques to allow him to participate in permafrost drilling.

Teaching points
1. Techniques used for drilling through permafrost
2. Construction and uses of settling tanks
3. Recovering frozen rods and casings
4. Caring for equipment when using calcium chloride

Teaching method
1. Lecture

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 9-2

Gain a detailed knowledge of reaming techniques and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate the skills necessary to conduct reaming procedures in the field.

Teaching points
1. Reasons for reaming
2. Reaming vs. cementing
3. Equipment and procedure
4. Reaming through cave-in
5. Reaming through squeezing ground
6. Possible problems

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
11 x 50 minutes

Training aids
1. Drill
2. Casing
3. Casing shoe
4. Reaming bits

Remarks
Consideration should be given to combining this objective with other operations in order to provide more practice time.

Checks
1. Written
2. Skill check

OBJECTIVE 9-3

Gain a detailed knowledge of fishing techniques and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to perform the procedures for fishing in the field.

Teaching points
1. Reasons for fishing
2. Special equipment
3. Techniques and equipment
4. Possible problems

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Drill
2. Taps
3. Rod taps
4. Casing taps
5. Spears

Checks
1. Written
2. Skill check

OBJECTIVE 9-4

Gain a detailed knowledge of drilling with lost circulation and demonstrate a skilled ability to peform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to recognize the conditions of lost circulation and respond with the appropriate procedures.

Teaching points
1. Definition and likely causes
2. Procedure using water
3. Procedure using mud
4. Using cuttings to get circulation return

Teaching methods
1. Lecture
2. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Drill
2. Lost circulation material

Remarks
This objective should be taught and discussed in class, then practiced through simulation. In order to foster instinctive response, the subject should be injected without notice during other drilling practice operations.

Checks
1. Written
2. Skill check

OBJECTIVE 9-5

Gain a detailed knowledge of setting wedges and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject of wedging and demonstrate an ability to perform the procedures.

Teaching points
1. Definitions and reasons for wedging
2. Types of wedges
    - Deflecting
    - Directional
    - Retrievable
3. Use of:
    - Bull nose bit
    - Wedge reaming shells
    - Universals
    - Short rods
4. Techniques and procedures
5. Organizing the work
6. Likely problems

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Drill
2. Wedges

Remarks
Due to the cost of materials, wedging procedures must be simulated. It may be advantageous to visit a yard to view the variety of equipment.

Checks
1. Written
2. Skill check

OBJECTIVE 9-6

Gain a detailed knowledge of setting up and maintaining blow-out preventers and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Comprehend the subject and demonstrate an ability to set up and maintain blow-out preventers.

Teaching points
1. Reasons for use
2. Equipment
3. Procedure
4. Regulations governing use
5. Possible problems

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
4 x 50 minutes

Training aids
1. Drill
2. Blow-out preventer

Checks
1. Written
2. Skill check

OBJECTIVE 9-7

Gain a detailed knowledge of setting up on ice.

Location
1. Classroom

Task
Comprehend the foundation construction on ice and ice characteristics in order to set up on ice.

Teaching points
1. Special foundation requirements on ice
2. Dealing with re-freezing
3. Strength of ice

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes

Checks
1. Written

OBJECTIVE 9-8

Gain a detailed knowledge of drilling using reverse circulation.

Location
1. Classroom

Task
Comprehend the subject in order to drill using reverse circulation.

Teaching points
1. Definitions
2. Reasons for use
3. Equipment used
4. Procedures
5. Potential problems

Teaching methods
1. Lecture
2. Discussion

Period allotted
1 x 50 minutes

Remarks
This objective should be tied in with OBJECTIVE 8-2 (use of air and foam).

Checks
1. Written

OBJECTIVE 9-9

Gain a detailed knowledge of soil sampling and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to conduct soil sampling.

Teaching points
1. Using triple tube to maintain fracture alignment
2. Drilling in glacier or ice pack (problems of hole enlargement due to melting)
3. Angle holes in water (slings)
4. Drilling horizontal or up-holes (modifications to equipment and technique)

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
3 x 50 minutes

Training aids
1. Drill
2. Sampling equipment

Checks
1. Written
2. Skill check

OBJECTIVE 9-10

Gain a detailed knowledge of the triple tube technique.

Location
1. Classroom

Task
Comprehend the triple tube technique in order to perform the procedures in the field.

Teaching points
1. Definitions and reasons for use
2. Equipment used
3. Procedures
4. Possible problems

Teaching methods
1. Lecture
2. Demonstration
3. Discussion

Periods allotted
2 x 50 minutes

Training aids
1. Triple tube equipment

Checks
1. Written
2. Oral

OBJECTIVE 10-1

Gain a detailed knowledge of hydraulics as applied to diamond drilling and demonstrate an ability to conduct minor repairs on a hydraulic system.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to recognize and repair simple faults in a hydraulic system.

Teaching points
1. Description and characteristics
2. Diagnosing hydraulic problems
3. Replacing hydraulic pump seals
4. Replacing a hydraulic pump unit
5. Replacing hydraulic hoses

Methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Hydraulic parts
2. Tools

Remarks
Emphasis should be placed on explaining common pumps and common problems.

Checks
1. Written
2. Skill check

OBJECTIVE 10-2

Gain a detailed knowledge of elementary diesel engine repairs and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to recognize and repair simple problems on a diesel engine.

Teaching points
1. General description and characteristics
2. General servicing (oil and air filters)
3. Replacing injectors
4. Cooling system
    - Flushing radiator
    - Replacing belts
    - Replacing hoses
5. Replacing the engine on a drill
6. Replacing the transmission

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Diesel engine
2. Diesel parts
3. Tools

Checks
1. Written
2. Skill check

OBJECTIVE 10-3

Gain a detailed knowledge of cutting and welding techniques as applied to diamond drilling and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to perform non-structural and non-safety cutting and welding tasks.

Teaching points
1. Cutting and welding equipment
2. Repairing tanks
3. Repairing the drill tongue
4. Repairing pump and engine frames
5. Minor repairs to drill base

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Cutting and welding equipment
2. Material

Remarks
Emphasis should be placed on the type of tasks that could be done by an amateur welder. The driller should only do patch-up work or general maintenance tasks.

Checks
1. Written
2. Skill check

OBJECTIVE 10-4

Gain a detailed knowledge of electrical fault finding and repairs as applied to motors and camp electrical systems, and demonstrate a skilled ability to perform the procedures.

Locations
1. Classroom
2. Work area

Task
Demonstrate an ability to recognize and repair simple electrical faults.

Teaching points
1. General description and characteristics of:
   - Engine electrical systems
   - Drill electrical systems
   - Support equipment systems
2. Replacing starters and alternators
3. Diagnosing and repairing engine electrical failures
4. General description, characteristics and capacities of camp systems and generators
5. Repairs to camp electrical system

Teaching methods
1. Lecture
2. Demonstration
3. Class practice

Periods allotted
7 x 50 minutes

Training aids
1. Tools
2. Electrical equipment

Checks
1. Written
2. Skill check